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Fight's On

Break turns, furballs, Immelmanns, yo-yos, rolling scissors — The language of air combat maneuvering (ACM). It used to be just the fighter jocks who got to talk like that, but now lots of other aircrews are getting into the act. Ever since the movie "Top Gun" hit the streets, it seems everyone wants in on the ACM scene. Perhaps the movie has made ACM more popular, but it wasn't a factor in the recent introduction of ACM-related training into non-fighter communities.

The Marines began investigating helicopter ACM more than 10 years ago. In recent years, operators of other helicopters and fixed-wing aircraft (including the P-3, S-3, SH-2 and SH-60) have incorporated ACM into their training as well. They are more focussed in on defensive air combat maneuvering (DACM), or evasive maneuvering (EVM) as it is known in helo parlance. They're not so much interested in shooting other aircraft down as simply avoiding the attention of someone out to do them in.

"Stung By a Hornet" by Mark McCandlish. This painting of a fictional encounter between a U.S. Marine F/A-18 and a Soviet MiG-29 has been reproduced as a limited edition lithograph, available from Dynamic Designs Illustrations Studio, P.O. Box 4053, Big Bear Lake, California 92315. Copyright 1988.

ACM has always been very popular with fighter aircrews. It is exciting and fun, especially if you win. The very nature of ACM offers a high level of exhilaration and a high potential for mishaps. It is gut-wrenching and demanding, and it stresses aircraft and aircrews to their limits. When that stress exceeds those limits, we lose aircraft and aircrews. Since the earliest dogfights in 1914, ACM-training losses were accepted as part of the price of readiness. The number of ACM-related mishaps has vastly decreased over the years, but they still happen. Over the last 10 years, we have lost an average of six aircraft per year; that rate is good compared to the past, but we can do better.

The articles in this issue cover many aspects of ACM from a variety of perspectives. The latest Training Rules (what we used to call "Rules of Engagement") contain plenty of common ground for all of us, whatever aircraft or form of ACM we fly. These time-tested rules are your best insurance against having your aircraft end up as a pile of mangled metal. There have been 62 class A flight mishaps in the ACM environment in the past 10 years. Over half, 37 (55 percent), involved uncontrolled flight, which is a major focus of this issue.

By the time this issue reaches you, I'll be packing my bags to leave. I came to this job 30 issues ago from the cockpit of an F-14, and now I'm going back. My hat is off to all of you that took the time to share your experiences and thoughts in the magazine. I had originally planned to recognize the people and units who have repeatedly submitted outstanding material, but the list grew too long. You've made it a great magazine and a great tour for me. Thanks.

Check six and fly safe!
Dave Parsons
Editor

This issue was specially designed for use in the training programs of the Navy Fighter Weapons School (Top Gun), Marine Aviation Weapons and Tactics Squadron One (MAWTS-1), and the Navy Aviation Safety School.

A special thanks to the following individuals and organizations whose help was instrumental in assembling this issue: Lt. Jim McAloon and Capt. Nate Hawkins, USMC, Top Gun; Maj. Ken Hill, USMC, MAWTS-1; Cdr. Larry Coppatelli and Capt. R.E. Joslin, USMC ASO School. Also, thanks to Blake Morrison and Marty Isham of the USAF Fighter Weapons School, and Lon Nordeen of McDonnell Douglas.

inside approach

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Fight's on! DACT between an F-16N and F/A-18A. This painting was done especially for this ACM issue by Eddie Moore, an engineering presentation specialist with General Dynamics, Fort Worth.

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. . . "Airspeed!" came the call from somewhere behind me as the Tornado tucked over violently to the left, rolling out momentarily only to level out a bit before starting the whole process again in the opposite direction. . .

It happens in

I HAD one of those weeks we've all read about. It didn't kill me, but I learned a lot. It started like any other Monday. I was driving to work. The weather was foggy, wet and one degree above freezing. Typical for northern Germany in the fall. I had decided to be safe and skip the autobahn for the slower and safer back roads. I knew that I was supposed to lead an eight-plane, and, naturally, I was thinking about the weather, my sick kid, the sinking dollar rate and everything except maneuvering my trusty 300ZX through the German countryside.

One curve was too sharp, too foggy and too slick, and I was too fast. During the next four seconds, I felt the typical time expansion that you experience during periods of extreme stress. The right front wheel went onto the shoulder, and my efforts to steer my way back onto the road proved fruitless. It was clear that unless I did something soon, I was going to leave the right side of my car on the upcoming guardrail. I made my varsity move, hauled the wheel back up onto the road and avoided the guardrail.

The car made a 540-degree (360 + 180) turn. Feeling that I had nothing more to lose, I straightened the wheel and stomped on the brakes. It almost worked. My left rear wheel slid into a ditch. I caught a ride home in a truck driven by a farmer who was hauling hogs to the slaughterhouse. After a quick phone call to the duty officer, I was able to extricate my auto with the help of a friend's truck, tow rope and a couple of passersby with shovels. Nothing was damaged, and I was moderately pleased with my reaction to impending disaster, even if the situation was caused by my own negligence. After a few grins, the incident was, for the most part, forgotten.

As it turned out, flying was cancelled for the day because of the weather, and my flight slid to Tuesday. I am sure I do not have to tell you how slowly I drove to work the next day. The weather at takeoff time was eight kilometers visibility, and the ceiling was reported to be 1,500 feet. I was to lead a fighter escort section while one of the junior crews led the entire flight. We were now six aircraft flying an attack progression flight (multiplane low-level with fighter threat) with a hard and fast TOT for our first target (a HAWK radar installation) and a sweep over the North Sea on the way home to pick a target of opportunity for practice missile attacks.

The young crew had their hands full: marginal weather, fighter threat in the form of F-4Fs from a neighboring Luftwaffe base, and a non-negotiable TOT. I paid particular attention to the back-up plans because I was the only mission commander and division leader in the flight.

We briefed, manned up, and were all in position for a formation takeoff, on time. We flew IFR radar trail departures with 20-second spacing until VMC on top. Then we cancelled and proceeded VFR. We formed up into our offset battle-box and flew south toward the initial point on the low-level route. We descended into marginal weather conditions for six aircraft. The visibility was poor, and I recommended to the lead crew that we fly 1,000 feet above the haze layer. This turned out to be 3,500 MSL based on the lowest forecast QNH setting of 1006 HPA.

Crossing the pre-briefed FLOT (forward line of troops), I mentally went through a few checklists: wings back to 45 degrees, groundspeed at 420 knots, ATM is cooled and the seeker-head is tracking. Fuel is 150 kilograms more than planned.

The ROE was straight forward: the escorts are bombers

THREES

By Lt. David L. Hardwick

first, and if fighters become a threat, they simulate jettisoning ordnance and engage the fighters so that the other four bombers may proceed to the target on time. As we flew south, it was clear that the Phantom base was socked-in, and this was confirmed when we checked in on fighter tactical. Fortunately, we had a back-up in a formation of clean Tornadoes practicing ACM. They had attended our brief and were instructed, if required, to hit the tanker and then engage the bomber flight anywhere along the route. The lead ACM Tornado acknowledged the clearance to engage, informing us that he would be a single due to his wingman's mechanical problems. His No. 2 had returned to base.

It was about this time that I remembered the auto incident from the day before. I began to feel a little uneasy and started looking for something which didn't look right. But there was nothing; everything was going as planned, or at least, by the pre-briefed back-up. I shrugged the uneasiness off with a laugh and said to myself, "You must be maturing and becoming safety conscious." But, I couldn't shake the feeling that these things occur in threes. It had to be my new baby, my new Volvo station wagon or any of the other trappings of domesticity that tend to rob a young, 30-year-old pilot of his virility.

Then I saw him! He was lower than we were, at our 9 o'clock, and I estimated that he had at least 600 knots. We were just finishing a 90-degree turn to the left when I picked him up as I was checking our six. He must have been trailing the flight, waiting for the chance to attack. I called for the

. . . The fighter was saddling in at our six, at three miles when I called, "Stand by pickle. Pickle now!. . .

flight to buster and kick 30 degrees to starboard. This would lengthen the fighter's ground track on the first two sections, but force the escorts to engage. He was 3.5 miles out and, due to his clean configuration, able to close quite rapidly on my wingman. He would have no problem achieving missile parameters with that overtake.

The fighter had his wings pinned back to 67 degrees and was approaching the simulated low-level heat-seeker window. I simulated jettisoning my ordnance, arming the missiles and charging the cannons. The HUD symbology was in the air-to-air mode, and I told my wingman to simulate jettisoning his ordnance except for one retard bomb.

The fighter was saddling in at our six, at three miles when I called, "Stand by pickle. Pickle now!" Per ROE, the fighter had to honor the defensive bombing technique, and he pulled into the vertical above the frag. Now, with a clean airplane and plenty of energy coming downhill, he was switching to me.

With our tanks and pylons, we were now approaching 550 knots, and my ears were buzzing from my RHAW indication of the fighter's radar lock-on. I told my WSO (waffen-systemoffizier) that I was pad-locked on the fighter and to monitor the cockpit. After a quick glance toward my wingman one-and-a-half miles abeam, and toward the four bombers safely opening the gap, I broke hard into the fighter and told the bombers to continue. No threat.

With 45 degrees wingsweep, maneuver flaps and slats, and throttles at idle, the fighter was unable to claim a shot and overshot to the outside. I called my wingman around hard to press the fighter while I yanked hard on the stick with my left hand, using my right hand to assist in craning my head back between the seat and the canopy on the right side to maintain sight.

Now, I see absolutely no problem with pilots flying with their left hands as long as they can come close to the same proficiency as they have with their right hands. Inasmuch as I pride myself in being a pretty good left-handed instrument pilot, I found out that, as of this writing, I had not mastered the left-handed dogfight.

I rolled hard to the right and sliced down to cut the corner on my 180-degree turn, and pulled very hard, too hard. The nose slid to the left, and I eased off the stick. Looking at the G meter, I saw no problem with 5.5 G's, but the Alpha was up around 30.

"Airspeed!" came the call from somewhere behind me as the Tornado tucked over violently to the left, rolling out momentarily only to level out a bit before starting the whole process again in the opposite direction. Obviously, I did not have the necessary altitude for that sort of aerobatics. My hands automatically reset the wings to the 25-degree position.

I slammed the throttles into max burner and watched the airspeed drop to 218 knots. Altitude. Where am I in relation to the ground? The flaps were moving to the mid-position, and I glanced over to see my hand on the control lever. I seemed to be on automatic, yet I couldn't figure my most important element, altitude. It was always there on my normal scan, and now when I needed it the most, I couldn't find it. And, just as suddenly, there it was, 3,500 feet MSL.

The Tornado rolled sharply on its back and penetrated the cloud deck, which only added to the confusion. The last call that I had heard from my backseater was the airspeed call. Was he reaching for the handle? I couldn't blame him, but I wanted a little more time.

"Stay one more roll," was all I could say as I avoided the prebriefed word "eject." And, suddenly, I remembered that the safety altitude was 1,800 feet MSL. Squadron SOP was to add 1,000 feet to the highest obstacle on the leg; that meant some mental gymnastics as the aircraft rolled wings level at 2,500 feet MSL, 1,700 feet AGL — at least. Airspeed coming up.

"I got it!" I yelled into the hot mike. Alpha was down, but jumped with each nudge on the control column. I started trimming the nose up as the airspeed was now steadily increasing, and we bottomed out at 2,100 MSL. I flipped the HUD to radar altimeter and now saw 1,310 feet AGL, reassuringly climbing. I heard the wingman call "Knock it off" since his lead (me) was in the clouds.

I gingerly bumped the flaps up and broke out on top still in full burner, accelerating through 300 knots. The departure had lasted only 10 seconds, but seemed like an eternity.

I looked to the south and picked up my wingman, and saw the fighter departing to the southwest, already taking a cut-off to catch the bombers before their TOT. Now my WSO said something to me for the first time since his airspeed call. "Danke Schoen!"

To say I was a little apprehensive going into the next engagement with the fighter would be a clear understatement. First the car episode, and then this fracas in the air. I was happy to know that my reaction time was good enough to pull my tail back from the edge, but it was disturbing to think that reckless aggressiveness had gotten me into both situations.

After the flight, I discussed the events with my WSO and apologized for putting our lives in danger due to my inability to recognize the oncoming departure. Every safety article I'd ever read came back to me now. "Break the chain before it breaks you," "Compartmentalize," "Circadian rhythm." Which of these applied to me?

I remember feeling embarrassed at the time because I had had more than a few giggles about other aviators' mistakes, and now it was happening to me. I felt vindicated the next day

preparing for yet another attack progression. I had let myself get behind the airplane, and I could do something about that.

I was the fighter lead and, with my wingman, would be attacking four bombers over the North Sea. All aspects of the flight were briefed by the experienced lead bomber crew, and I briefed the ROE. Nothing was left to chance, and I felt comfortable with the preparation. I truly do not consider myself superstitious; however, I do enjoy certain rituals before I fly that can be explained as habit pattern. I still tie my boots as I was taught in AOCS; and when I strap in, it is always left leg restraint, right leg restraint, left lap belt and so on. As part of my preflight, I still kick the tires, even though it is obvious that the tires are properly inflated. Being well prepared and ahead of the airplane would not prevent all problems in the air, but it would avoid those brought on by not saying "what if."

I took my section to 15,000 feet over the North Sea toward our first pre-briefed CAP station. I "what-if'd" to myself the entire transit. Our first two attacks went well, with good coordination between my wingman and me, and timely bug-outs to avoid any valid shots from the bombers. We had claimed two kills with missiles and guns and had filmed both engagements. Because of our fuel state, my wingman and I agreed that our next engagement would be the last so that we could recover together for the pre-briefed formation landing.

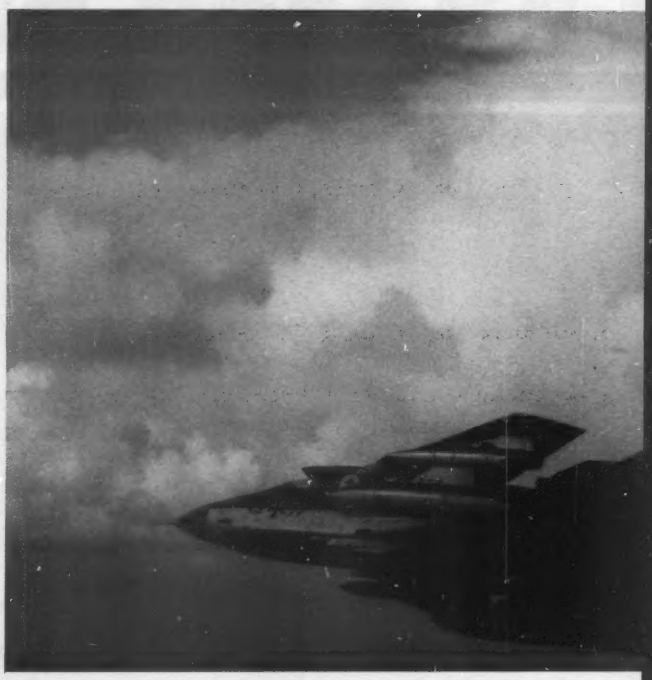
My WSO picked them up first, and I dove on them on his call. I spotted two Tornadoes and glanced in the mirror to see my wingman following me down. Coming downhill at 60 degrees out of the sun, I pulled the throttles back to idle to avoid overshooting and to stay transonic. We were saddling in on both the escorts and already in missile parameters before the bombers saw us. Our Fox 2 calls caused both escorts to make simultaneous missile breaks. I decided to continue for the gun shot and then bug out with my wingman toward home.

I yo-yo'd high to avoid the overshoot and slid down the bombers' wingline for guns. I called the bug-out and intended to drive the throttles into full burner, but they would not budge. Both throttles were frozen in the idle position, and my airspeed was now dropping below 350 knots. I leveled the wings and checked that they were swept forward, and trimmed the nose up a little, willing to trade a little airspeed for altitude.

As casually as possible, I informed my WSO that we had a problem, and if he saw 180 knots, he should eject. I would hold the aircraft at this altitude. I was scanning for anything that looked out of place, and at 250 knots, I picked up a switch that reminded me that we were in one of the few trainers.

"Check the throttle quadrant!" I screamed into the ICS. Another glance at the airspeed made my stomach start churning. 220 knots, and 1,000 feet AGL.

"Moment mal," my WSO called, "my nav bag is stuck in the throttles!" I told him, in not-so-polite German, that he had until 200 knots, and then I would begin transmitting Mayday.



He tried three times before he finally freed his oversize nav bag, and as I threw the throttles into afterburner, the airspeed dipped to 190 knots, then reassuringly started climbing rapidly. I struggled with both relief and rage at my WSO the entire uneventful trip home. What could he have been thinking? How could he have taken 5-G maneuvering at 600 knots and 200 feet so lackadaisically?

I was ready to hammer him as we walked to the debrief. After all, he had almost spoiled my perfect mission. I had attempted to foresee all possible pitfalls, and he almost screwed it up. Then he threw me off. He stood up before the entire flight, before we started the debrief, and explained the whole event in detail, basically putting himself on report. Afterward, he looked at me and apologized. Talk about feeling humbled. If anyone should have known how the guy felt, it was me. After all, hadn't I been the one who had pulled the Delta Sierra yesterday? We went over why it happened, and everyone learned something about stowing loose gear before maneuvering.

The one thing that sticks with me is that you can never take anything for granted when it comes to guiding huge pieces of metal through the air. I was caught off guard, and I had to rebound on instincts and experiences. The stories I had read helped me determine what the problems were and sort out chance from laziness. I had avoided disaster based on those rules and stories. I hope that someone out there will see a little of themselves in my story. ◄

Lt. Hardwick flew A-6s with VA-34 in USS *America* (CV-66) before joining the West German Navy Second Squadron in Naval Air Wing One as an exchange pilot. He has returned to the U.S. and to VA-42.

A "Daily" Edition. An F-14 instructor is assigned a replacement RIO for a 1 v 2 against an F-5 and an A-4. A dream come true — without a wingman to worry about, the instructor needs only a vague idea of when he's at the merge to complete the sortie. His fighter is located on the line away from the rest of the "up" jets. There are several aircraft launching at the same time, and the holidays have made manpower pretty scarce. A single plane captain, whom the instructor doesn't recognize, is launching the jet.

The pilot starts up, does his post-start checks and waits for the final checker. He sees his bogeys taxi by and take off. Impatient to leave because he knows the F-5 is fuel-limited, he asks the plane captain via signals if he has completed his walk around. The plane captain, who is under training and has never launched an aircraft in his life, does not understand the hand signal, but nods yes, anyway.

The instructor motions for him to pull chocks and taxies, skipping the final checkers who are nowhere to be seen. He takes off, enters the area and immediately accepts a vector. The replacement RIO is working well over his head today and achieves a radar contact on something at 25 nm. The instructor strokes burner. Going through 400 knots he feels a slight airframe vibration. He pulls the throttles back, thinking he has had a slight engine stall. The instruments look fine, however, and he plugs the engines into burner and fights two successful engagements before RTB. During the landing rollout, the crash crew reports that a small door on the port side seems to be missing.

Thinking they mean the hydraulic reservoir door, the instructor thinks nothing of it. Another F-14 crew comes up on ground and tells the instructor his daily door is missing. The light bulb finally comes on, and the instructor notifies base to have the M.O. and safety officer meet him at the line. The pilot egresses quickly upon shutdown and surveys the damage. The port and starboard daily doors (2.5 feet by 3 feet) are ripped off at the hinges; a hole has been punched through the starboard aux flap, along with a 3-inch gash in the leading edge of the starboard horizontal stab and a slight ding in the leading edge of the port vertical stab. As he is talking to the M.O. and safety officer, the replacement RIO approaches the instructor and asks, "Hey, did you see that we're missing the daily doors?" He receives a hurried debrief, four above averages to keep him quiet and is sent on his way.

Mishap of the Month. Two Tactical Weapons Unit instructors were programmed to fly two Hawks on a Dissimilar Air Combat Maneuvering (DACM) sortie against two RAF F-4Js. The sortie was to be flown in the Air Combat Maneuvering Range (ACMR) at Decimomannu where accurate monitoring and recording of flight profiles is used for debriefing the aircrew. Another pilot was authorized to fly as supernumerary crew in the rear seat of one of the Hawks.

The leader of the Phantom section briefed the sortie which was planned as Phantom versus the two Hawks, each element operating on a discrete frequency with its own dedicated Range Training Officer (RTO). The simulated weapon load was missiles for the F-4s, and missiles and cannon for the Hawks. The briefing included the "Kill Remove" procedure whereby an aircraft that was judged "killed" would fly back to the starting point for "re-arming" before rejoining the fight. At the end of the briefing, the importance of the two Hawks operating as a coordinated pair was emphasized and this point was reinforced during a short supplementary brief between the Hawk crews.

After several successful exercises,

AIR BREAKS

the formations reformed for another engagement. One Phantom and the No. 2 Hawk were "killed." The Phantom departed to the start point for "re-arming," but the Hawk was made "live" by the RTO before he reached the start point. Shortly afterward, the remaining Hawk "killed" the other Phantom which was directed out of the fight. Both Hawks were now vectored to intercept the first Phantom which was approaching from the north. During the transit to meet the threat, the two Hawks, now flying independently after the No. 2's "Kill Remove," did not regain visual contact with each other. No. 2 descended to 10,000 feet and No. 1, slightly behind, climbed to 18,000 feet. The target was at 11,000 feet.

After a prompt from the RTO to turn port, Hawk 2 saw the Phantom at his 10 o'clock at 1.5 nm; he continued to turn port in a gentle climbing attack with the Phantom countering left in a level port turn that put Hawk 1 nearly head-on. From slightly outside the Phantom's turn, and 7,000 feet above, Hawk 1 responded with a right-hand near vertical stern attack. After reversing port behind the Phantom, he fired his missiles and called "Going for a guns kill." He descended to the rear of the F-4. Hawk 2 maintained his port turn, inside Hawk 1, and the two Hawks collided at the Phantom's 7 o'clock at a range of 3,000 feet.

All three crewmen ejected from the Hawks at 370 and 250 knots, respectively. After their parachutes deployed, the aircrew found that their Mk. 4 flying helmets were loose and pivoted around their heads, impairing their vision. They discarded the helmets. Similarly, all three crewmen found that their oxygen masks had been ripped from the helmet mountings. With no wind, the chutes collapsed close to the survivors in the water, the rigging lines tangled with survival and flight equipment, and made boarding the dinghy difficult. Attempts by the aircrew to cut the parachute lines resulted in one pilot cutting the line to his sea anchor. Two Italian SAR helos were quickly on the scene and retrieved the three survivors.

Wing Commander Spry Says

The basic cause of this mishap was the breakdown in communication between the two Hawk pilots, which resulted in two independent attacks with similar weapons release parameters on the same target.

In the heat of the chase, it is all too easy to forget the basic principles of mutual awareness and concise, informative radio transmissions that are the hallmarks of an effective formation, whether flying close, or as in this case, widely separated. While the determination to achieve a kill is essential for any fighter pilot, it must not subliminate coordination and the cross-flow of information essential to the efficiency of the formation of a fighting unit.

— Reprinted from Air Clues

New G-Suit Hose Disconnects. According to a 1986 survey of GLOC incidents, there were 8,352 inadvertent G-suit hose disconnects in F/A-18s and F-14s. Apparently, most pilots failed to realize the significance of inadvertent disconnects. Fortunately, as a result of the survey, measures were taken to fix the problem. F/A-18 production aircraft, as well as the F-16N, now incorporate a new "female" disconnect design that is activated by a "straight pull." Retrofit for the F/A-18 is being accomplished through AFC 058. The Naval Air Development Center is currently verifying the disconnect's suitability for the F-14's cockpit and ejection seat.

You can identify the new disconnect by its raised outer lip. It requires 14 to 20 pounds, rather than 2 to 3 pounds, of pull. The design reduces the chance of knocking the hose free when you move around the cockpit. It also prevents the hose from disconnecting due to its own weight under G-loading.

The new G-disconnect does require extra care. Aircrew should grasp and rotate the male fitting as it is removed in order to reduce pull force and to prevent separation of the hose from the male coupling. F-16N pilots have also been advised to manually disconnect the G-hose during emergency egress on the ground in order to prevent getting hung up.

The high G-onset rate of today's fighters demands not only tremendous respect, but also conditioning, training, and awareness by today's crews in order to capitalize on aircraft capability. As pilots push the edge in any aircraft, the potential for GLOC exists. The new G-disconnect will help prevent GLOC. ◄

— Submitted by LCdr. J. Morse, NAVAIRSYSCOM

It is impossible to make anything foolproof
because fools are so ingenious.

Ace L.

F-14 Crew Coordination in Out-of-Control Flight

By LCdr. Gregg Howard

THIS wasn't Goose and Maverick. The pilot pushed the throttles to military and put the TACAN needle on the nose. He couldn't get on deck fast enough. As the Tomcat sliced through that air at 450 KIAS, the pilot's only thought was that he wished the cockpit behind him were filled with another 200 gallons of gas instead of 200 pounds of RIO. The RIO flipped the AWG-9 power switch off in frustration. "What was the use?" he thought. The front seater didn't appreciate his talents anyway. The only thought in his mind was that out of all the fighter pilots in the Navy, how did he draw this plumber.

What was happening to this aircrew? Most likely a breakdown in trust and crew coordination. With increasing frequency, accident investigators are finding lack of crew coordination as contributory causes of accidents. With the F-14 capable of generating 7 eyeball-out Gs and rates of descent in excess of 20,000 fpm during a fully developed spin, crew coordination is absolutely essential. Lack of it can be deadly!

F-14 NATOPS lacks specifics for crew coordination during OOCF, so here are a few items aircrews may wish to consider during OOCF training. During the departure the pilot should inform the RIO that he departed the aircraft. In many instances the RIO may be unable to detect the initial departure. During flight evolutions such as engaged maneuvering where the RIO is concentrating out the rear hemisphere, a departure could be interpreted as reversing or targeting another bogey. On the pilot's departure call, the RIO should knock off the fight and start focusing on the task at hand. Check and confirm airspeed and altitude.

Both pilot and RIO should determine the type of departure entered by completing an OOCF instrument scan and starting an OOCF checklist. Get the harnesses locked. There are essentially five departure types, and they are not all handled in the same way. Inverted stalls or departures may require full aft stick. Zero airspeed or ballistic departures require releasing the flight controls below 100 KIAS (check trim setting). Departures brought on by accelerated flight-control inputs or asymmetric-thrust inputs may require programming the stick full forward with opposite rudder.

Before adding opposite rudder in any departure, confirm the direction of departure by turn needle. The pilot should inform the RIO of departure direction and tell him what he is doing with the flight controls. In any case, the RIO should confirm all spoilers are down, indicating the stick is in a true neutral lateral position. If the spoilers are up during the initial phase of departure, the pilot may be inputting pro-spin controls. If the pilot is slow to respond, the RIO must remain calm and prompt the pilot with the first steps of the boldface; however, he should stop after the first step, and give the pilot time to analyze and respond. Either the pilot or RIO may be affected by time distortion during an emergency situation.

Let's take a case where recovery is not indicated even after the pilot has programmed full forward stick. Yaw rate is building. The pilot must put in anti-spin controls. The direction of the turn needle must be confirmed. Stick should be placed with the direction of the turn needle. Rudder, if not already displaced, should be displaced opposite the turn needle. Remember,

the control stick diagram is like a stop sign: Get full lateral throw combined with forward stick. Don't be tentative with the controls at this point —displace them fully to the stops. Tell the RIO of turn-needle direction and control-stick displacement.

The RIO should respond with TID-spin-arrow direction and wing-spoiler deflection. For example, during a left spin there should be a left turn needle, TID spin arrow should be left, and left-wing spoilers should be deflected up. Now the RIO should develop a cadence for airspeed and altitude. A calm cadence will help combat time distortion. At 90 degrees/sec yaw rate, the RIO's TID spin arrow starts to blink. A suggestion to the pilot to select Roll SAS on at this time, followed by full lateral and aft stick, may be timely although not required by NATOPS. Roll SAS on will give the pilot another five degrees of lateral stick authority.

With the controls displaced in the correct direction, the aircrew must now wait for one of three events.

1. Recovery. Indicated by yaw rate slowing or ceasing, AOA breaking and airspeed increasing. Yaw rate and airspeed are key indicators. Passing 200 KIAS, the aircraft is not spinning. Neutralize and recover at 17 units AOA.

2. Entering a flat spin. It will probably take three or more turns for the aircraft to reach 180 degrees/second yaw rate. A flat spin is verified by flat attitude, lack of pitch and roll oscillations, increasing yaw rate and increasing eyeball-out G. With the flat spin verified, the NATOPS recommendation is to jettison the canopy and RIO command eject. There seems to be conflicting philosophies in the F-14 community at this point. For example, if the flat spin is verified at 20,000 feet, many aircrew feel they would keep the anti-spin controls in and attempt recovery until reaching 10,000 feet. If you think this way, some things to consider are:

a. The longer you stay with an aircraft producing 6-7 eyeball-out G, the more likely you are to be incapacitated.

b. Both pilot and RIO should share the same philosophy. At least they should review this scenario and come up with a game plan they can agree on when they fly together.

c. Another reason the ejection option is given to aircrews in reaching a flat spin is that recovery altitude may take as much as 10,000-30,000 feet.

3. The 10,000-Foot Decision Point. At no lower than 10,000 feet, the pilot must inform the RIO whether he has control of the aircraft or not. If not, the RIO should jettison the canopy and command eject. If the pilot response is that he has control, the RIO should reply, "Approaching 200 KIAS."

Additional factors for crew coordination consideration during OOCF are:

a. Selection of hot mike.

b. Engine problems during or after recovery from OOCF.

c. Loss of ICS or other electrical malfunctions during OOCF.

d. Compound emergencies during or after OOCF.

I have tried to be specific. However, additional items will be brought out during ready room discussions and procedures trainers. Take the time to analyze, discuss, practice and standardize your OOCF game plan. It could save your life.

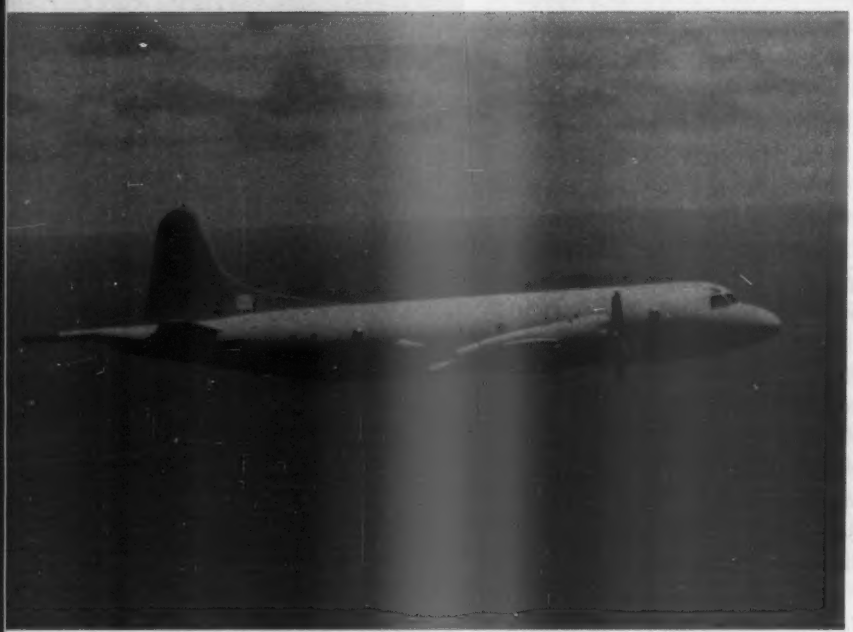
LCdr. Howard has more than 1,400 hours as a RIO and 1,800 hours as a pilot. He is currently serving with VF-43 as an adversary pilot and OOCF instructor.

John W. Williams

DACM

For the Big Boys

By LCdr. Mark T. Ackerman



A new paint scheme (low visibility) and a new skill to learn, DACM.

DEFENSIVE air combat maneuvering (DACM) was recently introduced in the P-3 community to improve our chances of surviving against the constantly increasing air threat. A major goal of the training is to teach crews how to exploit the full capabilities of their aircraft. Since the DACM program is new, there are still many refinements to be made in tactics and the training syllabus. Yet, we have gained useful experience in how to conduct the training safely and efficiently.

As a starting point, OPNAVINST 3710.7 defines ACM as "simulated offensive or defensive aerial combat consisting of (1) air-to-air engagements between aircraft, [and] (2) defensive maneuvers or other combat avoidance maneuvers by flights of one or more aircraft." Specifically, ACM is "aerobatic maneuvers in accordance with NATOPS manuals on scheduled training flights," and "air intercepts performed in accordance with [directives] and not pressed closer than optimum missile or gun range." For the VP community, the definition allows us to perform steep turns as part of the syllabus training flight, or to act as a target for interceptor training. However, to

Scott Steadman

Now that DACM has been introduced to the P-3 community, P-3 crews need to lean on their fighter cousins for corporate knowledge.

go beyond that by performing the types of maneuvers associated with DACM requires that we abide by the ACM training rules and requirements.

OPNAVINST 3710.7 further states that "The nature of ACM demands that pilots be thoroughly familiar with the performance capabilities and limitations of the aircraft being flown." One of the most important capabilities of the P-3 in air combat is turn performance. The straight, fat wing may not be good for speed, but it gives the P-3 excellent turn characteristics for so large an aircraft.

Generally, maximum turn performance — the greatest turn rate and smallest turn radius — comes during the highest G loading at the slowest airspeed, with G load having a greater influence than airspeed. To achieve optimum turn performance, it is necessary to fly at "corner velocity:" the minimum airspeed where the maximum structural load limit is available without stalling. Below that speed, the aircraft will stall before reaching maximum G; above that speed, G load is still limited by the aircraft load limit. In either turn, performance will be less than if the aircraft were flown at corner velocity.

Corner velocity for the P-3 (3Gs) varies with gross weight and other factors, but is around 200 KIAS at normal training weights with

maneuver flaps, slightly more with flaps up. Note that the use of flaps below the maneuver position decreases turn performance because the structural G limit is lower. With the flaps down, you may be able to make tight little circles but you will present about the same relative motion and difficulty to an attacker as a school bus.

A departure-and-spin-recovery-procedures brief is another requirement in OPNAVINST 3710.7 Fortunately, the P-3 is blessed with excellent stall characteristics, such as ample aerodynamic warning (buffet) and effective controls throughout the stall. Even in an accelerated stall under high Gs, where the transition from buffet to stall is more abrupt, the warning is quite adequate. The only caveat with stalls in DACM training is to avoid remaining in heavy buffet since it places unnecessary stress on the airframe.

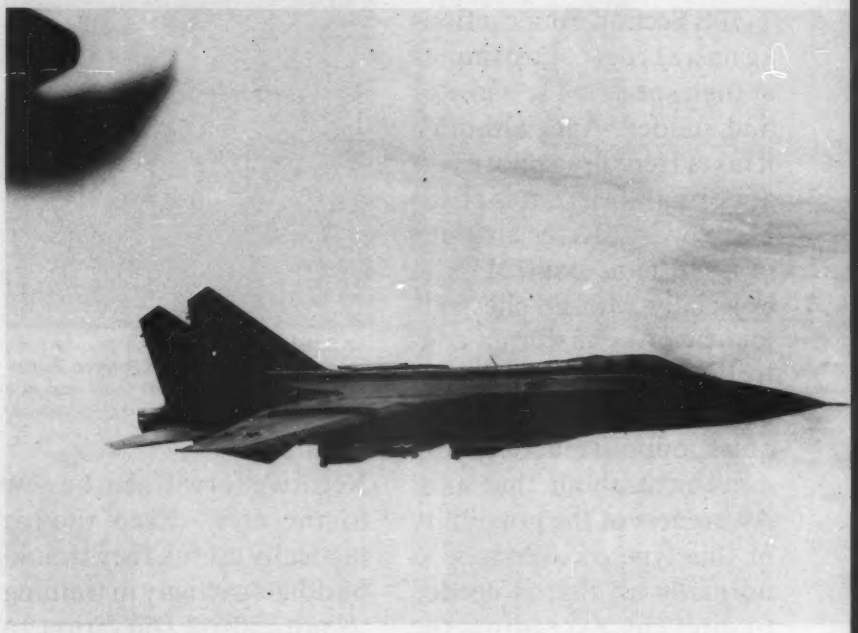
To summarize, keep the airspeed near corner velocity to get the best turn capability and avoid airframe overstress. Make control inputs smoothly and watch angle-of-bank and rate-of-descent to keep airspeed under control. These basic things will help you get the most out of your aircraft while remaining within its structural limitations.

A number of other ACM

Pilot Press

The potential for an air-to-air encounter between the Nimrod ASW aircraft and Argentine fighters during the Falklands war in 1982 prompted British interest in mounting Sidewinders on their Nimrods. Here, a Nimrod MR 2 of No. 120 Squadron, RAF, carries two AIM-9s.

training regulations are extensively discussed in OPNAVINST 3710.7. Training Rules (formerly called Rules of Engagement) are designed to reduce the chance of a midair collision. Although all aircraft should follow them at all times, primary responsibility for separation of aircraft in an engagement should rest with the adversary. Because of the P-3's limited maneuverability, and because the P-3 pilots' field-of-view is restricted, he may or may not be able to steer clear of the fighter.



A hostile fighter in your P-3's future? Soviet frontline fighters, such as this MiG-31 Foxhound, routinely conduct close intercepts of U.S. Navy P-3s patrolling the Pacific.

Airframe structural limits are another important consideration for P-3 crews. It's assumed that we're all familiar with the basic limits on airspeed, load factors and angle-of-bank (AOB). In a DACM training flight, it's unlikely that the airspeed limits would be exceeded. However, load factor (G) limits should be watched closely. In particular, be aware that during roll maneuvering, the load limit is reduced from 3 to 2.4 Gs of increased loads on the wing caused by aileron deflection and other factors. To exceed these load limits may or may not cause immediate structural failure (there are safety factors built in), but it will certainly decrease aircraft service life and increase the airframe maintenance requirements. During DACM training, be sure you apply adequate safety margins so that load limits are not exceeded. (This is another advantage of corner velocity. The elevator control forces remain high, making it difficult to pull more than 3 Gs, and there is good aerodynamic warning of the approach to the load limit in the form of stall buffet.)

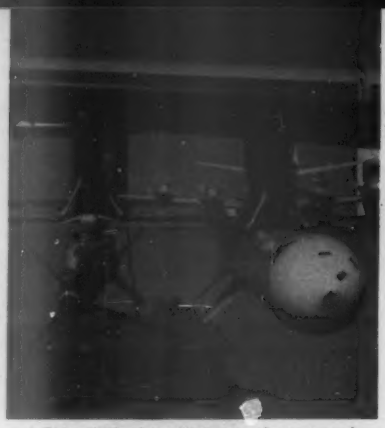
The results of inadvertently exceeding the angle-of-bank limits are not quite so serious. For a level turn, 70 degrees AOB and 65 degrees AOB require 3.0 and 2.4 Gs respectively. That's the reason for the coordinated turn-and-roll man AOB limitations.

As long as the load factor limits are observed, exceeding the AOB limits will not make the wings fall off. One area of concern, however, in high AOB maneuvering is to keep the G force consistent with the AOB when a level turn is desired. It's a common tendency to overbank or not pull enough Gs, resulting in poor turn performance, a high rate of descent, and a rapid decrease in airspeed. In this situation, if you try to stop the rate of descent without first decreasing AOB, you may exceed the structural limits at the higher airspeed.

Smooth control inputs will also decrease the chances of airframe overstress. NA-

TOPS Section Four cautions against abrupt control inputs at high speed in the elevator and rudder. And, although it takes Herculean pilot effort at normal speeds, it is possible to overstress the airframe in any of the control axes, especially with a "checked" maneuver — an abrupt control input to get the aircraft moving, followed by another quick, opposite input to stop movement about that axis. Awareness of the possibility of this type of overstress is normally all that is needed to prevent exceeding the structural limits with abrupt control inputs. In fact, it is much more common to see just the opposite, since few P-3 pilots are used to forcefully wrestling the aircraft around.

High load factors may also be unfamiliar to the average P-3 crew. OPNAVINST 3710.7 requires that "Prior to commencing ACM maneuvering, fixed-wing aircrews shall perform a G awareness maneuver. If the aircrew experiences loss of consciousness, the flight shall immediately terminate . . ." Although loss of consciousness is quite unlikely, it's good to show the crew what 3 Gs feel like (few have ever seen more than 1.5) and to give the pilots an idea of the control forces involved.



A Sidewinder installation on the outer wing station of a P-3, alongside a Harpoon. Experiments with this armament could lead to a more dangerous target for potential interceptors.

Negative Gs will also be new to the crew. Even though tactically useful, they should be done sparingly in training to prevent oil starvation to the engines and prop.

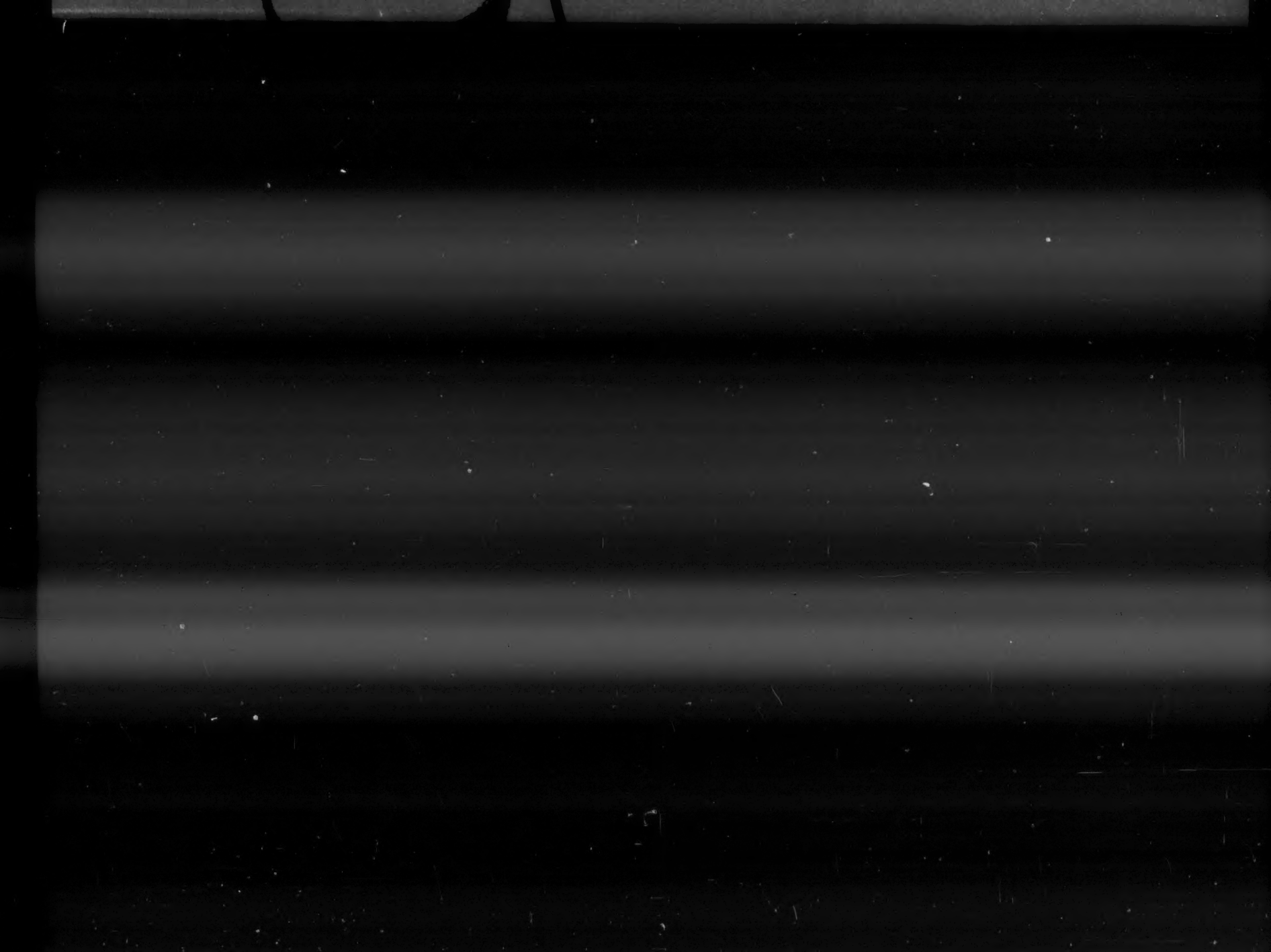
Before performing G awareness or other DACM maneuvers, be sure there is no gear adrift in the aircraft. It's surprising how things get up and move about during DACM, and you really don't want the coffee pot up in the cockpit.

When an unsafe condition develops, the ACM engagement should be terminated. In addition, it's time to "knock it off" when you lose situational awareness — the relative position of the players. There is little to be learned when you've lost track of the bogey. Also, remember the limited objectives of the program; don't get caught up in the excitement and continue the engagement after the lesson has been learned.

I consider the last point the most important. OPNAVINST 3710.7 says "Training flights shall be conducted pursuant to a formal training syllabus under the direct supervision of mature, experienced flight leaders and only after all participants have been thoroughly briefed on the conduct of the flight. Unscheduled simulated combat between naval aircraft or between naval aircraft and aircraft of any other service or registry is prohibited." There is probably nothing more dangerous to himself, his crew and the P-3 DACM training program than a pilot who attempts DACM at the wrong time or place.

Our approach to DACM training has been measured and conservative, and it should remain so until we have explored all of its possibilities. A single incident, no matter how minor, may end the training long before we've had the opportunity to fully develop tactics or present the syllabus to the fleet. Fly smart and fly safe so that we'll all have a chance to profit from DACM training.

LCdr. Ackerman has flown P-3s with VP-40 and as an instructor with VP-31. He now serves with Patrol Squadron Special Projects Unit Two at NAS Barbers Point. During his tour with VP-31, he helped introduce DACM to the VP community, flying P-3s against Navy and Air National Guard fighters.



GLOC

A RIO's Story

By LCdr. Ted Carson

THE Time: 0630, the morning after a Wednesday night at the O club. The place: West Coast ready room. The mission: a 1 vs. 1 similar defensive hop. The names: Ice (instructor pilot), Goose (student RIO), Maverick (student pilot) and me T-Bear, an instructor RIO.

The brief was long, detailed and professional. We manned up on time, took off and proceeded to the Papa/ACM area. Ice set his plane up 2 nm behind Maverick for the first defensive 400 knot, 15,000 feet canned setup. Ice urged Maverick on the UHF to go Zone 5 and start an easy right turn, at which time Ice called, "Atoll dead, six, 2 nm."

Maverick began executing the briefed procedures. Out of burner, break hard right, slightly nose low for 40 degrees deploying simulated chaff and flares, unload the aircraft lighting Zone 5 again and pull 6.5 Gs into Ice to neutralize. The maneuver was to be continued to an extention and re-engagement.

Nothing happened. I called, "pitch back, Maverick" while still looking at Ice. When I heard and felt no response, I turned to see, to my horror, Maverick's head slumped over to the left of his ejection seat. I looked down at the airspeed: 420 knots accelerating, 40 degrees nose low in Zone 5! I decided to make one more call, "Maverick, pull up, pull up!" No movement! I reached for the ejection handle while glancing at the airspeed, 480 knots accelerating. I thought, "Too fast, I'll die!"

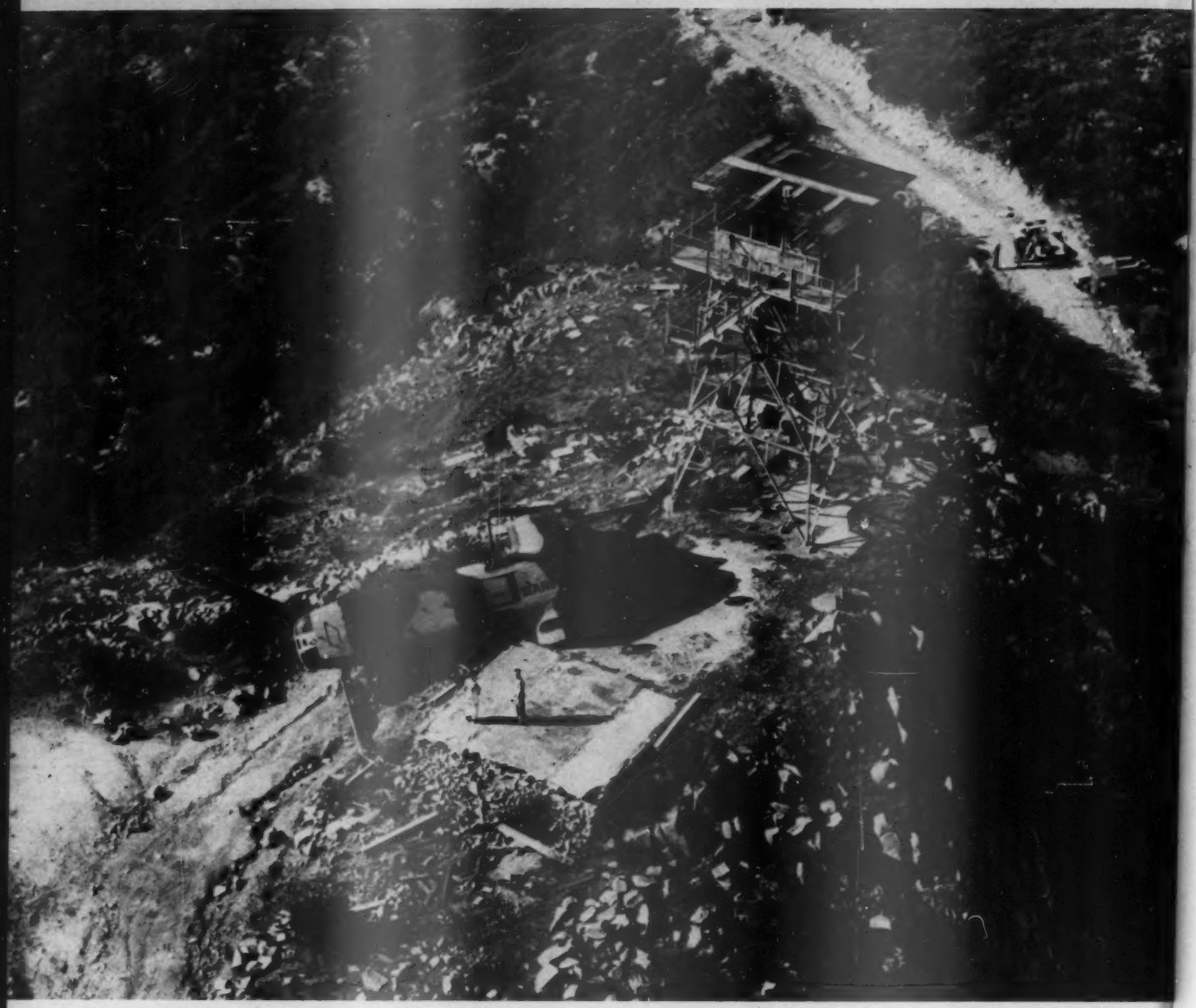
Ice now is yelling on the UHF to pull up. I hit the radio and said, "He's passed out. Maverick, pull up, pull up!" Ice was now silent, and the airspeed was passing 550 knots. Maverick's head moved and I yelled, "Maverick, pull up now!" Instantly, 9 Gs sustainced came on the aircraft, and we pulled out at 2,000 feet, establishing a 20 degree nose-high attitude.

In the debrief I found out Maverick passed out under G just prior to the pass and regained his eyesight soon thereafter. He said he saw the altimeter unwinding rapidly, airspeed increasing, but couldn't move. Then he started hearing my calls to pull up. As soon as he regained control of his arms, he grabbed the stick and pulled it straight back until he saw he was nose high. Then he blacked out again for a second time, which I didn't realize. We immediately terminated the hop and landed.

It turned out that Maverick had stayed up late Wednesday night and hadn't eaten his usual breakfast. The fact that it was his first real ACM hop in six months compounded the problem, resulting in a very low G tolerance. He's instructing others now, and I'm still accident-free. I learned an important lesson about G-tolerance and about waiting too long to decide to eject. I'm sure Maverick and I both remember every detail of that day.

LCdr. Carson is a RIO with VF-211, an F-14 squadron based at NAS Miramar, Calif.

With the aircraft nose low and accelerating through 480 knots, the RIO and his driver are in the "box." I know of two similar instances where both RIOs ejected and died. The best you can do is hope the pilot wakes up; then sweet talk him into pulling back on the pole. As indicated in NATOPS, any ejection above 450 KIAS is extremely hazardous. The Air Force has a good HUD tape of an F-16 crew in a similar situation. Cdr. James P. McAllister, Fighter/Attack Branch Head, Aircraft Operations Division, Naval Safety Center.



Giving 100 Percent Makes All the Difference

By 1stLt. Chuck Johnson

ONE of the disadvantages of being a squadron H2P (helicopter second pilot) is soaking up the tasks others do not want. In certain circles it is known as the "Nick the New Guy" syndrome. Being young, new to the fleet and eager to prove ourselves, we take on these tasks with a full head of steam. A recent flight demonstrated differing degrees of involvement between a fellow H2P and myself.

We were both scheduled to observe flights in separate CH-46s during a 2 v 2 helo vs. fixed-wing EVM hop. Having been in the fleet a few months longer than the other observer and having done this before, I was less

than thrilled to go flying and not get a chance at the controls. This would be the first time for my fellow H2P. He enthusiastically approached this new experience as a chance to gain knowledge from his fleet-experienced aircraft commander. Why didn't I look at it that way?

At briefing time everyone got serious, including me. The mission commander conducted a section brief and thoroughly discussed all maneuvers and EVM terminology. The mission commander's brief was followed by the HAC's NATOPS brief, which included crew coordination and responsibilities.

We manned our machines and flew south for a face-to-face brief with crews we would be flying against. When we arrived, my counterpart and I went to a local squadron to visit some friends while the pilots completed their briefings. The visits completed and the briefs finished, we were once again ready to man our "battle Phrog."

I climbed aboard, donned my gunner's belt and ICS and prepared for launch. We soon arrived in the operating area and split the flight to practice individual aircraft maneuvers. Our HAC demonstrated the maneuvers that would be flown. I took this opportunity to practice my footing in the aircraft cabin so that I'd be able to track bogies without rolling around as we yanked and banked.

Maneuvers complete, we decided to land in order to conserve fuel while waiting for our adversaries to arrive. The other observer continued playing the game. He kept an eye on my aircraft, practicing calling out its position to the HAC. Again I felt I wasn't needed, so I sat back and enjoyed the view as the pilots searched for an appropriate LZ. The zone selected was a concrete pad, adjacent to a Forest Service observation tower. The HAC flew over the zone to check for suitability and set up his approach to the left of the tower.

The approach was normal and comfortable. As the pilot stabilized in a 10-foot hover, the crew chief made forward and left calls for proper positioning on the pad. Being curious, I looked out the right side to see what the crew chief was directing the pilot to avoid. By the time I looked at the crew chief and out the right side of the aircraft, it was too late. There was no time to warn the pilot. I realized what was about to happen.

The aircraft began to shake violently as the rotor system disintegrated after hitting the tower. We dropped suddenly. The next few seconds seemed like an eternity as I flew about the cabin like a rag doll on the end of a string.

At this point, I'm sure my counterpart did not like what he had just seen. As we set to land, he saw a violent nose pitch-up and then the aircraft disappear behind a ridgeline.

Luck was with us that day. We finally came to rest on the pinnacle of the mountain we were attempting to land on. When the motion stopped, I found myself lying on my side, staring up at the deck of the cabin. All my appendages seemed to work so I stood up and, along with the crew chief, went out the nearest exit with the pilots right behind us. Within minutes we were picked up by the mission commander and taken to the nearest hospital for the nightmare of needles and paper work — not too bad an outcome when you consider the alternatives.

Crew members and observers must remember that they are integral parts of a team. We expect teamwork of ourselves as pilots; we should demand it ourselves when we serve as observers. While participating in this flight, I didn't have my heart in it. A little more maturity on my part would have helped me remember the importance of my role in the crew. Had I tried to gain experience from this flight, I might have been a little more alert about the situation that developed around the helo. Technically, I had no observer duties during the landing phase, but I was another set of eyes that could have been used.

NATOPS states that all occupants will be seated and belted for takeoff and landing phases, or while the rotors are turning, except when getting on or off the aircraft. Because of my need to move about the cabin as an observer, I was wearing only a gunner's belt which didn't completely satisfy this requirement. Although luck probably saved my life, why depend on luck when you can hedge your bets?

Situational awareness on the part of the other observer (who had a more serious attitude) paid off. Had there been serious injuries requiring emergency treatment, my fellow observer's vigilance would have saved lives. The mission commander could not see our aircraft because he landed in a different LZ and was facing the opposite direction. Heads-up calls by the other observer alerted him to our predicament. We were on the way to the hospital within minutes of the helo coming to rest.

I didn't give 100 percent that day. I'm lucky enough to have been given a second chance. I do not think I will ever need a minor attitude adjustment again as long as I am able to fly. I did not ask for it, but I learned more from that flight than I ever expected. ◄

1stLt. Johnson is a HAC and ground safety officer with HMM-161, MAG-16, 3rd MAW at MCAS Tustin, Calif.

1stLt. Johnson didn't cause this mishap, but he did recognize a shortcoming in his own attitude. I don't think he's alone out there. Not everyone is so willing to "put themselves on report" even when, such as in the case here, it helps foster a better safety atmosphere. Bravo Zulu to 1stLt. Johnson for sharing his story. — Ed.

. . .There I was on my back with less than 100 KIAS, pulling toward my opponent's 6 o'clock. Suddenly the aircraft started falling out of the sky. . .

The Soft Deck

By LCdr. D.W. Eld

ACM Training Rules are the self-imposed restrictions under which we operate our aircraft during air combat maneuvering. We used to call them ROE (rules of engagement). They are designed to safely push us and our aircraft to the limits so that we get the most out of our training. The rules aren't arbitrary.

We all have listened to or recited the ACM Training Rules during briefs, but how well do we understand or follow them? As an ex-adversary instructor, I have seen many rules broken or misunderstood. The most frequent violation concerns the soft deck — an altitude of 10,000 AGL, below which no slow-speed maneuvering is allowed.

The definition of soft deck is simple enough, except for just exactly what constitutes slow-speed maneuvering. Everyone seems to have his own idea of how slow he can safely fly his aircraft. But is his idea really safe?

A-4 squadrons define slow-speed maneuvering as any sustained airspeed below 200 KIAS and/or AOA (angle of attack) above 20 units. That works fine for the A-4, but what about the A-7 or your aircraft? You may need to bump it up some. Your community should set a minimum. You may even want to establish more than one minimum; i.e., AMF vs. non-AMF in the A-7.

During an in-house flight as an adversary instructor, I found myself in the typical fight, rolling scissors between A-4s when my aircraft suddenly departed from controlled flight. There I was on my back with less than 100 KIAS, pulling toward my opponent's 6 o'clock. Suddenly my aircraft started falling out of the sky.

After caging my brain, I started going through the departure-spin procedures. "Let's see," I thought. "Monitor AOA, airspeed, altitude. Altitude! Oh *@#+, I'm at the soft deck."

Fortunately, the AOA quickly broke, and I found myself screaming for the ground in a near vertical dive. Pulling out at 20-plus units AOA, I recovered with less than 2,000 feet to spare. I had departed just under 12,000 feet AGL and managed to recover safely. Lucky I didn't have a back-seater because he probably would have ejected.

Was I pushing the soft deck? Yes. To be that slow less than 2,000 feet above the soft deck, I was pressing the limit. Why? Because I didn't want to lose the fight! What would have happened if I had departed at or below the soft deck? You probably would have read about my incident in a mishap report.

Why is the soft-deck rule broken so often? Have you ever found yourself topping out in a rolling scissors, executing a guns defense or established in a flat scissors at or below the soft deck? Most of us have done this at one time or another, and some pilots do this routinely. Most of these violations of Training Rules are unintentional, a result of not monitoring altitude closely. The intentional rule breakers don't want to lose the fight, so they continue pressing, busting altitudes. After all, losing in ACM is like coming in second place in a knife fight. So is hitting the ground!

Haven't we read about these guys in numerous MIRs — the guys who pressed the soft deck too far and never made it? The next time you find yourself wrapped up in an ACM engagement, don't let your ego get the best of you. Follow the Training Rules. After all, they are rules to *live* by. ◄

LCdr. Eld is an attack pilot for VA-227, based at NAS Lemoore, Calif. He has served previous tours with VT-21, VA-27 and VA-127 as an adversary instructor.

It Can Happen to Me

By LCdr. John DuGene

I'VE spent the past 12 hours thinking about life. It started after I almost had a midair during a normal rendezvous, where the "blue sky" theory, by definition, doesn't apply. It was over in about five seconds.

We were rejoining as a six-ship formation for a second ACM engagement, and No. 5 was designated as the anchor out in front with everyone else joining on him. As No. 3, I was 2,000 feet below him with a "visual," doing a running rendezvous while staying level at my altitude to avoid a wingman between us. Clear of my wingie, I finished the final portion of the rendezvous with a hard dig to the inside and a climb to join on No. 5.

While trying to keep track of the other players and joining from a low inside position, which was visually not normal, I became disoriented. Drawn to No. 5, my aircraft was in a steep rate of climb toward him. I could not figure out which way he was turning. Bunting over, rolling and pulling as an automatic defense reaction caused our aircraft to miss each other by only about 40 feet. Four other aircraft were in close vicinity. No excuses. It just wasn't smart, patient piloting.

Time slows down, in situations like this one, enough that I could remember every detail during those five seconds. I tried to analyze aircraft positions, flight paths and relative motion. I was confused and realized that I didn't know much, except it looked like we were about to hit. The bunt was instinctive, but I recall thinking about not overstressing the aircraft with negative Gs. I was still confused about where the other aircraft was going.

As we were closing fast, I thought my last conscious moment would be of plexiglass shattering in all directions against a clear blue sky. I rolled and pulled to expose my belly so if we hit, it wouldn't be through my canopy.

Then I thought maybe I had a chance. I also thought momentarily about the mishap board, especially if we hit and only were damaged. His aircraft looked so big. I knew the most dangerous place for a midair was with someone in your flight. My pull down to the left cleared our flight paths, only by a small margin, because he was still in at right-hand turn.

I learned later that No. 6 was also joining at the same time and was in a cross-under maneuver. I never saw him. Three planes were in the same piece of small sky. Since there was no overstress, no ACMI as a witness and No. 5 was unaware, there was no incident, only a humble debrief. It wasn't pretty, and I was still shook up as I thought about it.

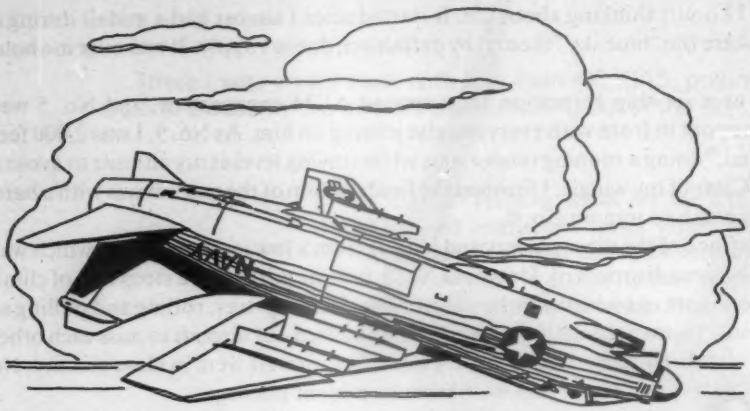
What information could I pass on to help prevent such incidents? Even as a 2,000-hour-plus pilot, I found the fundamentals of flying to be critical. Whether on a low level or at sea, flight discipline is essential. Accumulated flight hours just mean you might know more through experience, not that you have to concentrate less.

Although experience can make things work better, conversely it can put a pilot into a tighter box when things don't work. Rejoins are dangerous, and the corollary still stands that your wingman is the most dangerous aircraft in the flight.

Although I had flown 11 times in the past two weeks, my proficiency in multi-plane engagements was low. Tactically it seemed OK, but the finer details, such as rejoins, obviously were not. My desire to make things happen, to get the rejoin accomplished expeditiously like before when I was on the step, lulled me into engaging my brain first without patient thinking. It would have taken only another 30 seconds to do it better and safer.

It's important to approach that fine line of optimum flying from the safe, conservative side. I thought I was flying smart and well within my capabilities when actually I wasn't. Now I believe that it **can** happen to me. ◄

LCdr. DuGene has been on an Air Force exchange tour with the Nellis Agressors at Nellis AFB, Nev., flying the F-5E Tiger II. He flew the F-14 with VF-84 off USS *Nimitz* (CVN-68) and RF-8s with VFP-63 off USS *Coral Sea* (CV-43).



Out-of-Control Flight

. . . I hate it when that happens!

By LCdr. Gregg Howard

ASK any naval aviator what scenario he would least like to encounter, just after carrier landings at night on a pitching deck, and it would most likely be out-of-control flight (OOCF). Like any flight evolution that you are unfamiliar with or that you don't understand, you feel apprehensive. Because of unacceptable losses of aircraft from OOCF, the Navy began a training program in 1979 to acquaint fighter aircrews with the hazard. Both VF-43 on the East Coast and VF-126 on the West Coast were tasked with training aircrews in how to deal with OOCF. The squadrons were equipped with T-2C Buckeyes specially modified for spin training. By exposing fleet aircrews to an academic syllabus and practical demonstrations of spins in the T-2, aircrews are better armed to avoid and successfylly recover from an OOCF situation. Recent mishap statistics have demonstrated the success of the program.

Despite the benefits of the OOCF training program, there have still been losses. Most of the OOCF losses are due to four primary reasons:

- Insufficient altitude to recover from OOCF.
- Incorrect analysis of flight condition or spin direction.
- Early or improper application of departure or anti-spin controls.
- Lack of crew coordination.

Each of these problems requires a different solution. Our current Training Rules take into account the altitude required for recovery from an OOCF situation; yet, aircrews occasionally disregard hard-deck restrictions and don't always get away with it. The solution here is to simply follow the rules.

In several cases, the aircrew improperly analyzed the OOCF condition they were in. Many OOCF episodes are violent and cause considerable disorientation. Your game plan, as stated in the brief, may not be that easy to execute. One of the most effective parts of OOCF training is exposure to an actual OOCF flight, which shows how hard it is to analyze your flight condition. Since intentional spins are prohibited in fleet aircraft, the T-2 OOCF

sortie is your only chance to experience the cockpit sensations of full-blown OOCF in a training situation. Make the most of it.

Apprehension has undoubtedly caused the loss of several aircraft through early or improper use of flight controls. The F-14, in particular, is not recoverable when it is in a flat spin. F-14 aircrews, worried about flat spins, have jumped on the controls too soon and have aggravated their situations rather than helped them. Since intentional spins are prohibited, it is wise to make the most of the OOCF training to familiarize yourself with the dynamics of OOCF. You can supplement this training with simulator training. Aircraft just don't go into spins from normal balanced flight. To react properly, you need a sound knowledge of the OOCF aerodynamic flight characteristics and how they relate to your particular aircraft.

In multiplace aircraft mishaps, poor crew coordination keeps cropping up as a causal factor. Too many mishap investigations reveal that one of the crew members was silent or there was serious miscommunication in the cockpit. Aircrews should work out their game plan on the ground and run through it in the simulator. Pilots should let the other crew member(s) know the game plan. Conversely, the pilot could really use a back-up on altitude and airspeed calls, boldface procedures and knowledge of the NFO's game plan. You'd think this information was obvious — until you read the results of a mishap investigation.

To gain a better understanding of OOCF, let's take a look at some simple working definitions and characteristics of the aerodynamic phases of flight leading to a fully developed spin. First off, aircraft just don't go into spins from balanced flight. There

Peter B. Mersky

A VF-43 crew preflights their T-2C for a spin flight at NAS Oceana.

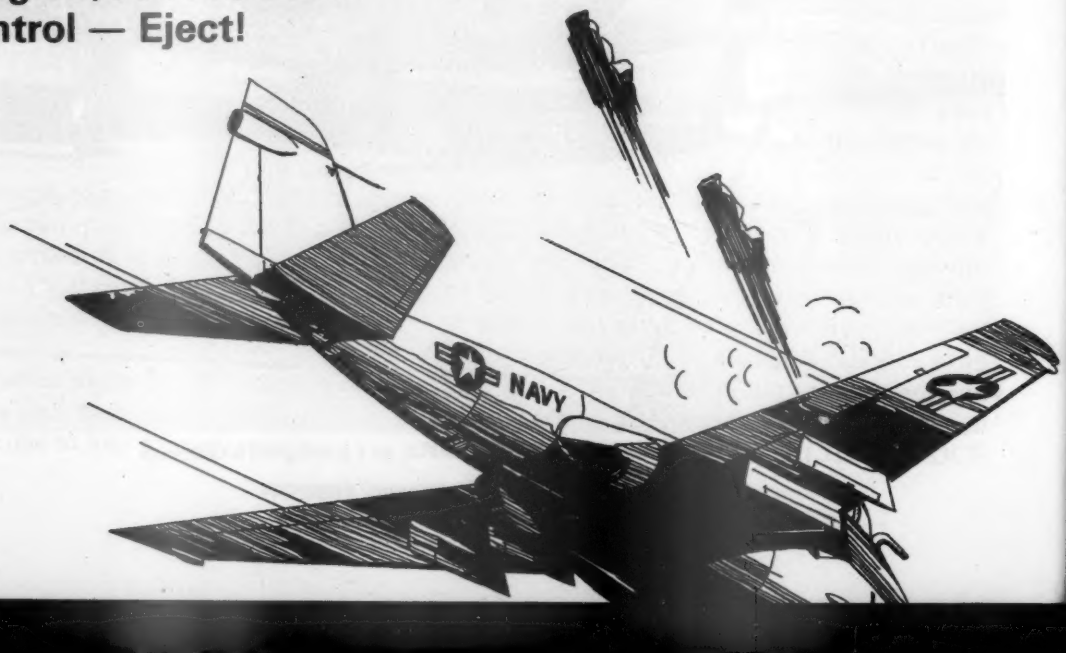
are general aerodynamic phases that all aircraft go through that are readily identifiable, although they are frequently confused.

Stall — The angle of attack for maximum usable lift at a given flight condition and aircraft configuration. Some aircraft have pre-stall warnings such as rudder shaker or aural warnings. Most stalls are preceded by buffet, generally accompanied by decreasing lateral stability. Recovery involves decreasing AOA. This decrease in AOA is generally accomplished by leveling the wings and placing the flight controls to neutral or slightly forward and adding full power, followed by an optimum AOA recovery to minimize altitude loss. An important secondary concept about stalls is that an aircraft in an angle of bank will have a lift-drag differential between the up-going and down-going wing. This often leads to progression into the next phase of OOCF. External store configuration will also have varying impact on stall speeds and may give different stall warning indications.

Have an ejection decision game plan. Have your ejection decision made before you walk to your jet. Know your aircraft recovery airspeed and altitude requirements. If passing 10,000 AGL out-of-control — Eject!

Departure — Typically defined as uncommanded ROLL, YAW or PITCH. Such descriptive terms as roll-off, nose slice or pitch-up are commonly used to describe the event. Generally two conditions must be met in order to obtain a departure. A flight control surface must be at or approaching a stalled flight AOA, and sideslip or yaw must be present. Yaw may be generated by uncoordinated flight control inputs, asymmetric thrust, rigging problems or other unbalanced flight parameters. When faced with a departure, pilots should stop whatever they were doing that caused the departure. Recovery requirements again require a pilot to reduce the AOA below a stalled airspeed value and prevent yaw build-up. Most aircraft NATOPS require positive pilot action such as neutralizing all controls, checking trim settings, locking harness, checking aircraft configuration clean, checking altitude and analyzing departure mode. Neutralize and analyze!

Post-Stall Gyrations (PSG) — Defined as random motions about any or all aircraft axes. An aircraft tumbling, snap rolling or flip-flopping may be used to describe PSG. It only occurs after a departure. PSG differs from a fully developed spin in that a spin has repetitive motions. During a spin you will see the same event occurring over and over again. The turn needle will usually oscillate during PSG. Yaw rate is extremely difficult to determine either from outside references or from the turn needle because of lag. PSG may be very violent and disorienting. Cockpit forces can be very high. Generally, flight control inputs other than neutral during PSG will likely become pro-spin controls. Many air-



crews have misinterpreted this phase of flight for a spin; thus proper analysis is crucial.

Incipient Spin — This phase of OOCF is extremely difficult to define and recognize because phases of OOCF aren't always clear cut. They tend to blend. Most aero experts agree, however, that sustained yaw rate begins during the incipient spin. Usually the incipient spin is preceded by some type of nose-low departure or PSG maneuver, which then develops into a sustained yaw rate. AOA is continuously above stalled AOA. Turn needle again may initially lag during this phase.

Fully Developed Spin — In the fully developed spin, the aircraft has reached an equilibrium. Yaw rate has matured to its maximum (usually 90 to 120 degrees/sec, although in the case of the F-14 it can get as high as 180 degrees/sec). The aircraft is descending rapidly in a spiral, with very little forward movement. Auto-rotation has been achieved due to lift and drag differentials on the up-going and down-going wings. A fully developed spin is characterized and confirmed by pegged AOA (30 units upright/0 units inverted) and pegged turn needle (left or right needle indicates direction of spin whether the aircraft spin mode is upright or inverted). The turn needle is the flight instrument upon which anti-spin recovery controls will be based. Airspeed is low, usually below 100 KIAS. (The airspeed indicator may show a constant "zero," or it may oscillate within very low airspeed limits.) Recovery is achieved by reducing AOA and arresting the yaw rate. Recovery is indicated by yaw rate slowing or ceasing, AOA breaking and airspeed increasing above a nominal value, usually 150-200 KIAS. If you're above 200 KIAS in all aircraft categories, you are *not* spinning.

Flying your aircraft to the edge of the performance envelope means sometimes going over the edge. When that happens, you have to be ready for OOCF. Here's some considerations for use in your squadron OOCF program. You can't rely on the periodic OOCF training at VF-43 or VF-126 to be the sum total of your training program. It should be only a start.

Practice departure avoidance. Know your personal and aircraft limitations. Use 1 v 0 hops to practice tactical maneuvers and sharpen skills. Don't let your first 1 v 1 dissimilar hop also be the first time in months that you've practiced a guns-defense maneuver. Use flight simulators for emergency procedures training and crew coordination.

Develop a spin scan. Spin scan consists of AOA, airspeed, altimeter and turn needle. Your scan needs to be fast and accurate. Many squadrons highlight these instruments with reflective tape. Crew coordination also needs to be incorporated. In the F-14, the pilot can verbally call out AOA and turn-needle indications, and the RIO can respond with airspeed and altimeter calls.

Use a checklist. Make an OOCF checklist part of your combat checklist. Ensure lap belts are tight, rudder pedals are adjusted for full throw, cockpit is secure and visor is down. If you fly a fighter, be prepared at all times. The checklist should be used for AIC, ASCM profiles, as well as ACM.

Be aware of physiological forces during OOCF. Know and expect the severe flight forces that may occur during OOCF. Consider high lateral cockpit forces, time distortion, difficulty in focusing and possibly "eyeball-out G" as part of the OOCF scenario. Keep your game plan simple. Test it in the simulator and during your OOCF sortie in the T-2.

For multiplace tactical aircraft, successful crew coordination during OOCF is critical. Rates of descent during a fully developed spin usually exceed 20,000 fpm. That doesn't leave a lot of time to react. Coordination between aircrew must be accurate and timely. Your SOP should spell out crew responsibilities for OOCF. Individual aircrews should regularly be refreshed in the simulator.

Have an ejection decision game plan. Have your ejection decision made before you walk to your jet. Know your aircraft recovery airspeed and altitude requirements. If passing 10,000 AGL out-of-control — Eject!

Lastly, know your own aircraft flight characteristics and OOCF emergency procedures intimately. This article has been a general discussion of OOCF. Some aircraft, like the F-14, have peculiarities that don't apply to others. Know and have confidence in your NATOPS procedures and be prepared if you ever have to use them. ◄

LCdr. Gregg "Slick" Howard is currently the OOCF phase leader and safety officer for VF-43 and has accumulated over 800 spins in the T-2C Buckeye. He has been an adversary instructor in both AIRLANT and AIRPAC squadrons. He has flown the F-4, F-14, A-4, F/A-18, F-15 and F-16.

Tumbling Tomcat

By Lt J.E. McAloon

. . . We were now riding the F-14 "Whisperjet," and the old "It can't happen to me" suddenly became "Holy cow! I can't believe it's happening to me!" . . .

SIXTY degrees, nose high, 130 knots, dual compressor stalls, dual overtemps. . .Out of knots and out of ideas. There we were!

How did we end up in this predicament? It started out as a 1 v 1 ACM hop against an A-4E Mongoose. We discussed different types of fights against the A-4 including the step-loop and extension-pitchback fight. Our step-loop game plan was to meet the A-4 beak to beak, extend out and then up, achieve horizontal and vertical separation, then reverse to employ forward quarter weapons against the bogey. The vertical reversal technique we would use was the "pushover" — a zero-to-negative 1 G pushover to approximately 90 degrees nose down, rudder roll to place lift vector on the bogey, then positioning the nose for a subsequent Fox-1 or Fox-2. Properly executed, the pushover provides a quicker reversal than the nose-low slice turn.

Our man-up, launch and flight to the warning area were uneventful. The initial setup was at 15,000 feet, 350 KIAS, with one and one-half miles separation. Following the "fight's on" call, both aircraft turned in with a port-to-port pass at the merge. According to our game plan, we unloaded, picked up 1.0 mach, went 30 degrees nose high for 10 seconds, followed by 60 degrees nose high for approximately 10 more seconds.

During this time the A-4 had marched around the corner assuming an out-of-range trail position well below our altitude. Passing 27,000 feet with sufficient vertical and nose-to-tail separation, we decided it was time to execute our

vertical reversal and finish this guy off.

Decelerating through 200 KIAS, Mike, my pilot, retarded the throttles to military power to increase the stall margin. While attempting to maintain a tally on the A-4 at a deep 4:30 to 5 o'clock position, he unloaded to 0-0.5 G with both engines at military. Immediately thereafter, the aural overtemp warning tone sounded.

We scanned our engine instruments, and Mike confirmed a left engine stall with a rapidly rising TIT and left stall warning light. Mike executed the boldface procedures for a compressor stall by maintaining approximately 0-0.5 G flight and pulling both throttles smoothly to idle. Airspeed was now decreasing through approximately 100 KIAS, and he used the remaining control authority to roll right wing down trying to get the nose down toward the horizon. Rechecking the instruments, Mike found left engine TIT was now pegged and right engine TIT was rapidly rising through the overtemp region (1,350 degrees plus). He secured the right engine immediately and left the port engine at idle to provide hydraulic power for flight controls. Aircraft attitude was now about 25 to 30 degrees nose high, 40 degrees right wing down, with zero airspeed.

Fortunately, we were not *completely* out of ideas. We had a sound basic knowledge of NATOPS and previous emergency trainer sessions that duplicated this situation. We were 20 to 30 degrees nose high, 40 degrees right wing down, out of knots, one engine shut down and the other cooking. Following a "lock your harness" call, Mike neutralized the controls while I visually confirmed neutral lateral stick, i.e., no spoilers left or right. As airspeed passed 150 KIAS, we secured the port engine because of the extreme overtemp condition.

With both motors off the line, electrical power was temporarily lost until airspeed picked up enough for windmilling hydraulics to power the emergency generator. We were now riding the F-14 "Whisperjet," and the old "It can't happen to me" suddenly became "Holy cow! I can't believe it's happening to me!" Passing 20,000 feet, 350 to 400 KIAS, and 30 degrees nose low, we initiated windmill start procedures for the right engine.

With throttle already off, airstart switch on, rpm at 20 percent and TIT at 400 degrees, Mike brought the right throttle around the horn to the idle position. After what seemed like an eternity, the starboard engine relit as we passed 13,000 feet. One subsequent attempt at relighting the port engine confirmed our suspicions that it would be of little use for the remainder of the flight. We made an "uneventful" single-engine landing back at NAS West Coast.

In retrospect, what were the lessons we learned and what could we have done differently?

There is no substitute for a thorough knowledge of your aircraft's NATOPS. Should sound familiar, but how well do you *really* know your jet? When was the last time you opened your personal NATOPS? Took a no-kidding, no-gouge, closed-book exam? A boldface exam?

Do you know what airspeed will give you the required rpm for an airstart? Airspeed for emergency electrical power? What do you have on emergency power? With no power?

Is there any conflicting or unclear information in your aircraft's NATOPS? If so, have you submitted a NATOPS change proposal to correct the situation? In this case, the "old" vertical recovery procedures state "below 40,000 feet altitude at greater than 130 KIAS, if in afterburner, reduce throttles to MIL as soon as possible and while forward airspeed still exists."

A closer examination of the Engine Stall Prone Areas graph shows that airspeeds for throttle transients in and out of afterburner are a direct function of both airspeed and altitude, and, specifically, that any afterburner throttle transients at 130 KIAS above 25,000 would most likely result in a compressor stall.

My gut feeling is that there are a lot of us fleet guys out there who could be a little more conscientious about knowing the finer points we used to know as students.

There is no substitute for having been there before. Having practiced similar scenarios in the simulator and having thought about what I would do saved my day for me. Making the right decisions when you're in trouble is not particularly difficult (if not instinctive) when you've done it before. So, the next time you're scheduled for that NATOPS qual or emergency trainer, don't cheat yourself with a quick 30 minutes of minor emergencies and an instrument approach to good old home base. Jump into that briar patch and make yourself work for the next hour with multiple emergencies, less than ideal weather and an unfamiliar field.

While multiple emergencies don't occur very frequently, they do happen. This particular incident required immediate action on five separate emergencies in roughly 30 minutes: single compressor stall, dual compressor stall, vertical recovery/zero airspeed, dual engine shutdown/flameout, and windmill airstart. When your "we were there" situation comes along, there is absolutely no doubt that sweating bb's during constructive simulator time is money in the bank toward a safe and happy landing.

RIOs, B/Ns, TACCOs et al are not riders! We should be as knowledgeable as our pilots about aircraft systems and boldface emergency procedures in spite of these subjects being commonly referred to as "pilot stuff." In this case, I was actively involved, backing up boldface procedures; providing timely, correct inputs; and making this an *aircrew* effort. A well-coordinated, knowledgeable crew will reinforce each other instead of creating additional confusion.

Hindsight is 20/20. Rather than trying to restart an engine that had just overtemped for more than 30 seconds, we might just leave well enough alone next time on a nice VFR day and bring it home single-engine. Also, you might want to take a trap next time realizing if the bidirectional hydraulic pump fails you're left with only aux and emergency brakes. Don't be so happy that the immediate emergency is over that you relax and fail to deal with a perceived lesser emergency. ◄

Lt. McAloon served with VF-31 and is now an instructor at Top Gun.

Snake eyes

Helicopter aircrews embarked aboard ship have been on alert 24 hours a day. We have escorted minesweepers at sea, defended ships against boat and air attacks, and acted as the eyes of the fleet.

PH2 Elliot

HMLA-169 flew mixed sections of AH-1W Super Cobras and UH-1N Hueys equipped with the defensive armament system (DAS). Here, GySgt. Matthew B. Whitaker peers from behind a .50 caliber mount in a UH-1N.

C.D. Siegmund

An AH-1W Super Cobra of HMLA-169 flies upwind of USS *Okinawa* during deployment in the Persian Gulf.

and the Cobra

By 1stLt. Joseph Malek-Madani, USMC
and 1stLt. Carl Siegmund, USMC

THE alarm goes off at 0400. I climb out of my rack and bounce off a wall locker while trying to find my shaving kit. My roommates' grumblings echo behind me as I trudge to the head. The "hot" water is cold, as usual, and my grogginess is fast disappearing. I manage to get into my flight suit and make it to the ready room with a few minutes to spare for the 0430 brief.

I'm flying with the operations officer. His crews are to be on time. The helicopter direction center (HDC), the weather man and S-2 (intelligence) give their pitches. Although the mission brief has become standard over the past four months, we go over it in minute detail. We have to because we've just started another typical day in the Persian Gulf aboard USS *Okinawa* (LPH-3).

Each crew member has been on a similar mission at least 50 times. Today, two of our AH-1W Super Cobras will escort three RH-53D minesweepers to a minefield near Iran's Farsi Island in the northern Gulf. There will certainly be Iraqi F-1s, surface contacts, helicopters and occasional Iranian fixed-wing aircraft to contend with.

The 1MC rings out five bells as our skids leave the deck. Although loaded to its maximum gross weight, the Super Cobra is quick and agile. The newest Cobra is capable of carrying TOW, Hellfire, Sidewinder, Zuni, 2.75-inch FFAR, a 20mm cannon and a variety of air-dropped explosives. The helo is built for such taxing environments as the Persian Gulf, where high temperatures and density altitudes steal power. It can carry far more ordnance at greater speeds than either the AH-1J or AH-1T.

Flying at 50 feet, we lead the RH-53Ds to the sweep area. The penetration checklist is completed, meaning that all systems are armed and ready as we approach our destination. Once there, the 53s go to work, joined by four waiting oceangoing minesweepers (MSOs). Our Snakes, armed with powerful telescopic sights, scan the area for contacts. Nothing just yet, but the day is young.

At predesignated intervals, we are relieved on station by a mixed section of Cobras and Hueys so we can refuel. Armed with the defensive armament system (DAS), the Huey is capable of carrying external stores, such as 2.75-inch rocket pods, and mounts the .50-caliber and 7.62mm M60 machine guns. The Huey has performed well in the Gulf, giving the commander added flexibility.

At 1000, two Iraqi Mirage F-1s flying in ship attack profiles, pass us, going south at an altitude of

C.D. Siegmund

A Super Cobra of HMLA-169 flies low over the water at the start of a mission in the Persian Gulf. The AH-1W carries Sidewinders in its new role as an escort for minesweeping helicopters and surface ships.

Armed with TOW missiles an AH-1W Super Cobra of HMLA-169 flies low over the Persian Gulf during a 1987 deployment.

C.D. Siegmund

150 feet and at a distance of 1,000 meters. U.S. forces were aware of the inbound Iraqis and had alerted us. Five minutes later, the F-1s came back close enough to give us a look at their ordnance load. Our Cobras, armed with Sidewinder heat-seeking missiles, are well equipped for air combat. As briefed, the operations officer signals us to set up blocking positions between the threat and the minesweepers. The Iraqis pass without incident, but this time, the F-1s have picked up company: an Iranian F-14 and F-4. The HDC relays to us that the two fighters are 24 miles out and closing fast. At eight miles, they break off.

Later in the day, a dhow (a small native fishing boat) tries to go through the sweep area. The Cobras convince the fishermen to look for another route. The steel cables towed by the RH-53Ds would slice the wooden dhow in two.

Lookout responsibilities are crucial. Although we had excellent warning of approaching fast movers, getting a tally in hazy conditions was another matter. Predeployment training really pays off.

By 1200, we've been in the cockpit for almost six hours and are looking forward to being relieved. The HDC acts as air traffic control and gives us the direction and distance back to *Okinawa.* En route, two Saudi Arabian F-15s decided they want to take a closer look at us. HDC has been keeping the F-15s and Snakes appraised of each other's position. Nevertheless, there is tension until positive visual identification is made. At relative closure speeds of over 600 knots, a lot of aircraft look alike. Finally, we land and swap crews so the Snakes can return to duty.

What the aviation combat element of Contingency MAGTF (CM) 1-88 has done is unprecedented in a combat environment. Helicopter aircrews embarked aboard ship have been on alert 24 hours a day. We have escorted minesweepers at sea, defended ships against boat and air attacks, and acted as the eyes of the fleet. Through the farsightedness of the squadron, we had done these things in training so that we could carry out our missions anytime and under any condition. This has been done without a single mishap.

HMLA-169 began realistic training immediately after finding out about its deployment to the Persian Gulf. We kept training until we arrived in the Gulf, and we never stopped. When we were called out on actual missions, we were ready.

A basic reason for the success of our training was that we followed the MAWTS ACM guide

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and the T&R manual. These references provided a solid framework to bring every aircrew up to speed in a variety of areas, especially the role of "fighter" for our escort missions.

We all benefitted from increased awareness of the need for crew coordination, both in the cockpit, and within the flight formations. A key lesson was that section integrity was *very* important and it *doesn't* happen overnight. Keeping sight of airborne and surface threats while maintaining flight discipline within the formation takes a lot of situational awareness. When flying in mixed sections of Cobras and Hueys, as we often did, the section leader must be aware of the limitations and capabilities of his wingman.

Lookout responsibilities are crucial. Although we had excellent warning of approaching fast movers, getting a tally in hazy conditions was another matter. Pre-deployment training really pays off. We worked with VMFT-401 and other squadrons at Yuma to calibrate our eyeballs to pick up bogeys and assess their identity and range.

. . . Don't forget to stay out of the water. Our XO was famous for harping about the radar altimeter — and he was right . . .

For the Cobra, assessing correct range for Sidewinder launch parameters is an important basic learning step. An excellent article is "Training With the AIM-9" by Capt. Mark Mahafy, in the MAWTS Newsletter for September 1986. During training, air-to-air TACAN can be used to determine ranges between dissimilar aircraft if the TACTS Range is not available, or your helo isn't TACTS-capable. Equally important, all helicopter crews need to know the threat ranges of an adversary's heat-seeking weapon. You may be able to identify any aircraft from a model or slide projected on your ready room wall, but try telling an Iranian F-14 from a Saudi Arabian F-15 down low in the haze. Any time you spend at Yuma or elsewhere working with fast movers will pay big dividends.

While you're doing all this, don't forget to stay out of the water. Our XO was famous for harping about the radar altimeter — and he was right. The Persian Gulf is often beset with milk bowl conditions that obscure the horizon. This can be disorienting and hazardous. Radar altimeter (altitude) doctrine has to be standardized, and all pilots need to understand it. The radar altimeter, coupled with good instrument scan, is your best insurance against controlled flight into the drink, and best assurance of remaining the "Snake Eyes" for the Fleet.

1stLt Malek-Madani and 1stLt. Siegmund are pilots in HMLA-169.

The operational mission described was adapted from an article by 1stLt. Malek-Madani published in the May 1988 issue of the Marine Corps Gazette.

On the flight deck of the USS *Okinawa,* an AH-1W armed with two Sidewinders prepares to launch with a CH-46.

C.D. Siegmund

If I Just Had a NATOPS Manual

By Paul Entrekin

WHEN I first started flying, NATOPS was there — pocket checklists, flight manual, operating instructions, etc. NATOPS was there when I joined my first squadron and again when I instructed at the training command. It was there in countless Approach stories I read. It governed how I flew; it helped me prepare. I knew from Approach what usually happened if you didn't follow it. Early on, I thought the repeated bold-face exams and annual requals were a pain; but when I became an ASO, my attitude matured, and it became a trusted friend and aid to teaching the "bubbas." I didn't realize it then, but I assumed NATOPS would always be there for me. Then one day, it wasn't. That was the day I bought my MiG.

There I was with a "brand-new" vintage (Chinese Navy surplus) Soviet-made MiG-15 of Korean War fame and no NATOPS, not even a reasonable facsimile of a pocket checklist. How I longed for anything with that familiar blue cover on it. I was anxious to fly my new aircraft and get it on the air show circuit so it could earn its keep. Even though I had nothing to rely on for even rudimentary start procedures, I found myself constantly tapping my own NATOPS experience and old Approach stories for help. No matter how anxious I was to fly my MiG, I knew that I had to proceed slowly.

My basic problem was two-fold. I had to come up with something patterned after a pocket checklist to handle any emergencies and establish some basic procedures for start, shut-down, landing speeds and such. Since mine was the first of five private MiG-15s "in-country," I couldn't turn to anyone else. I was breaking new ground. I began to realize the enormous amount of work and resources that go into the making of our suite of NATOPS publications, which we take for granted. Secondly, I needed to be ready to transition to the MiG. An aviator doesn't just jump into a front-line fighter, even a vintage one, without training. I was a helicopter pilot by trade with a lot of T-34 time as an instructor. I thought, how would I do it in the Navy or Marine

Corps? The answer was that I needed something akin to the T-2 and TA-4 flight experience to let me stairstep up to my MiG.

I found suitable substitutes in the Casa Saeta jet trainer and T-33, both of which were available in the U.S. for dual instruction. After approximately 10 hours in the Saeta and about 40 hours in the T-33, I felt myself ready to take the MiG aloft. The only hurdle was the FAA. They scrutinized my documentation of the training I'd had and looked at my aviation background. They also specified that I make "three successful landings," which they observed. Then they would grant me my "letter of authorization" to fly the MiG.

My first flight will always be permanently etched in my mind alongside the memory of my first solo. My pucker factor was as high as any hop I ever had. I went through my homemade checklist twice, feeling a lot of anxiety. How I wished for the comfort of a familiar blue PCL by my side, backed by hundreds of hours of flight tests. I got the engine running and managed to taxi to the hold short under the watchful eye of the FAA flight examiner who wanted to see three takeoffs and landings before he would bless me to go into the world with my MiG. The FAA wanted to make sure I was safe, NATOPS or not.

My heart rate increased in synch with the throttle as I inched it forward to begin my takeoff roll. At nose wheel liftoff and beyond the speed I had determined to be safe for aborting, I felt most vulnerable. As the MiG gained speed and altitude, my pulse rate subsided to a slower rate. I gently experimented with the controls and was assured by their smooth response. Satisfied that I was flying the aircraft and not the reverse, I began playing "what-if" emergencies in my mind. What if I lose hydraulic pressure? Electrical power? The engine? Could I make it to high key? What is high key for the MiG-15? A lot of questions shot through my head, some that hadn't occurred to me until then. And I didn't have answers to them all. No NATOPS.

During the past year, I have continued to find those answers and incorporate them into my poor-man's NATOPS. Throughout the whole process, I continued to reflect on the fact that I never knew what truly good NATOPS was until it wasn't there for me. Oh, how I've missed that "big blue sleeping pill!"

By the way, anyone out there want to tangle with a helo pilot who is flying a MiG-15? After a face-to-face brief and IAW NATOPS, that is . . . ◄

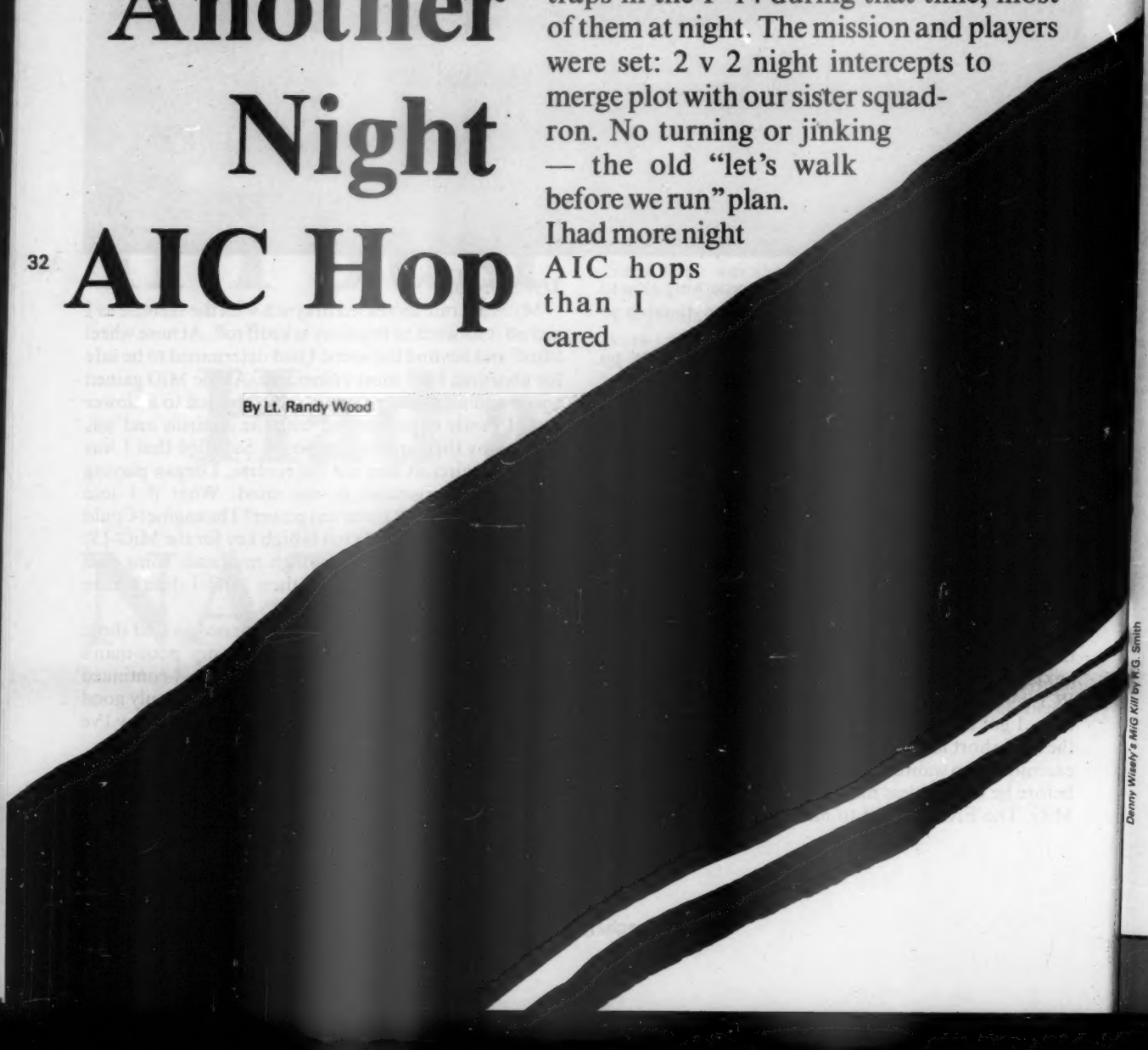
Paul Entrekin was commissioned in 1977 and after winning his wings, flew UH-1Ns with HMLA-369. His final assignment was with VT-3 as an instructor flying the T-34C. He left the Marine Corps in 1987. He flies his MiG-15 on the air show circuit.

. . .Anyone in the aviation business has not only been confused at night trying to judge relative motion by just looking at light patterns, but probably scared to death. If he says he hasn't, he's a liar. . .

Just Another Night AIC Hop

By Lt. Randy Wood

IT was our first flight (and first night mission) of the cruise. We were heading west in USS *Boat*, approximately 400 miles from home. Operating off the ship was nothing new for the squadron. We had logged more than six months at sea the last year, and I had accumulated 130 traps in the F-14 during that time, most of them at night. The mission and players were set: 2 v 2 night intercepts to merge plot with our sister squadron. No turning or jinking — the old "let's walk before we run" plan. I had more night AIC hops than I cared



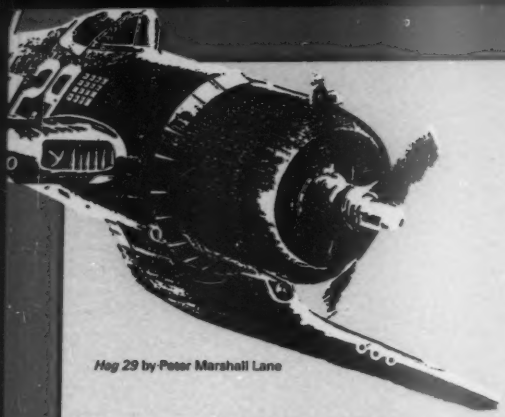
Denny Wisely's MiG Kill by R.G. Smith

McDonnell Douglas

Termination

Any training rule violated
"Knock it off/terminate" is broadcast by any aircrew/controller
Dangerous situation develops or there is loss of situation awareness
Out of control flight situation develops
Radio failure by any aircraft
Bingo fuel state is reached
Training objectives have been accomplished
Unbriefed aircraft enters the engagement area and is detrimental to flight safety
Any aircraft rocks his wings
At the completion of engagement, aircraft shall maneuver to deconflict.
All ACM participants terminate engagements when a dangerous or rapidly deteriorating situation is recognized.
"Knock it off" means all participating elements in an exercise will cease maneuvering.
"Terminate" applies to individual elements or engagements within an overall exercise will cease maneuvering for that particular engagement without "knocking off" the entire exercise.

Danny Wisely's MiG Kill by R.G. Smith



Hog 29 by Peter Marshall Lane

Encounter With the Red Baron by Frank Wootton

ACM perspectives

By LCdr. Dave Parsons

ACM and safety haven't always gotten along. Usually one of two extremes resulted. Either no safety guidelines were developed (or adhered to) and losses were accepted as part of doing business or the safety rules were so restrictive that ACM training was curtailed to the point of being ineffective. Out-of-control flight has always been the major cause of losses in ACM training, and it isn't relegated solely to peacetime. An estimated

Panther's Quarry by Barry Bichler

35 MiG-15s were lost during Korea to out-of-control flight.

A new relationship between ACM and safety was forged in 1968. As a result of a NAVAIR-SYSCOM study, now famous as the Ault Report, our ACM training was completely revamped. Although the intent was to improve less than satisfactory air-to-air performance over North Vietnam, ACM training not only underwent a renaissance in training, but in safety as well.

Top Gun was born out of this renaissance and so were dedicated adversary squadrons with specialized instructors as well as the Air Combat Maneuvering Range (ACMR). Rules of Engagement governed the conduct of ACM training and spin training was introduced when losses to spins became a problem.

It is a common belief that ACM is hazardous. It is potentially hazardous, but this is materially reduced by our current procedures rigorous briefing, dissimilar aircraft and specialized adversary pilots. Safety is not a counter-argument to ACM. In fact, the reverse is true. Reducing ACM training not only reduces ACM competence, but also increases the prevalence of unplanned, unbriefed ACM or ACM-like maneuvers. The result of these two is more accidents.

George Haering, 1979

Ace of Aces by Robert Taylor

One parting word of advice: There is a definite tendency on the part of every one of you to throw caution to the winds every time you meet the enemy. We've been lucky so far. But it's dumb. We've spent hours and hours on tactis, designed not only to destroy, but also to protect ourselves. Keep that thought foremost in your minds. Rip 'em up and down, but do it smartly.

LCdr. James H. Flatley,
CO, VF-10, January 1943, in a farewell letter.

Range Wars by William S. Phillips

One last word before you set out to become the next jet ace are . . . No guts, no glory. If you are going to shoot him down, you have to get in there and mix it up with him. If he's damn good, you are immediately going to be confronted with a problem we sincerely hope you will have solved during your training mission.

Maj. Frederick C. "Boots" Blesse, author of ACM text titled "No Guts, No Glory"

Anything is possible — but you have safety factor if you have to fly ne. . . . If you are single, you have many blind spots.

Eric Hartmann 352 Kills

Be extra cautious when flying ACM over water; it is easy to get up and down mixed up when everything is blue.

Maj. Richard Hardy

dvantage Cunningham by Mark Waki

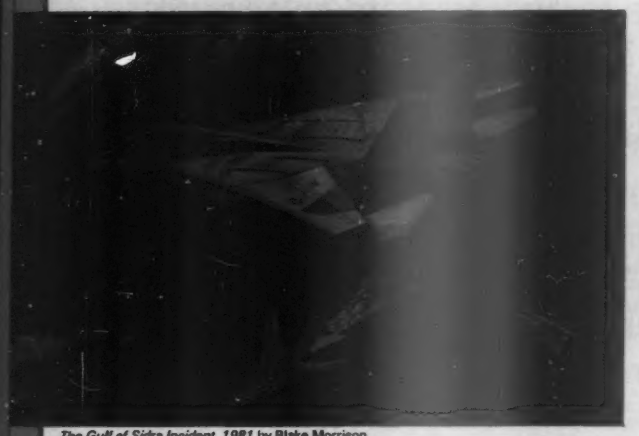
MiG-21s by Eddie Moore

In executing the maneuver, the major banked the aircraft steeply, losing sight of the "enemy." A dangerous situation developed, for the two planes were separated by an impermissibly short distance. This first class pilot, who had mastered the art of interception in more difficult conditions, failed because he had underestimated the role of visual observation and of circumspection . . . Safety is determined by the ability of the pilot to combine continuous visual observation of the air correctly with the reception of information from the on-board radar equipment, the flight operation officer, command post and the ground radar operators.

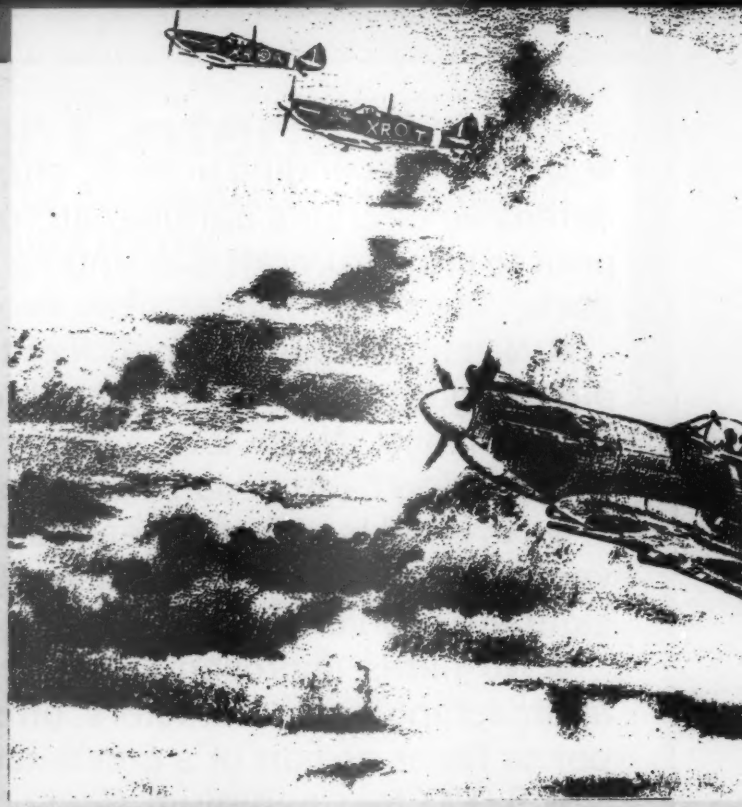
LtCol. A. Fedotov
Military Pilot 1st Class
Soviet Air Force,
1979

Unofficially, we seldom took off on a training mission without searching the skies for fighters from other areas and organizations, particularly the Navy, with no preplanning or coordination between participants.

LtGen. Winton W. Marshall, USAF (Ret.)



The Gulf of Sidra Incident, 1981 by Blake Morrison



Eagle Squadron Spitfires by Blake Morrison

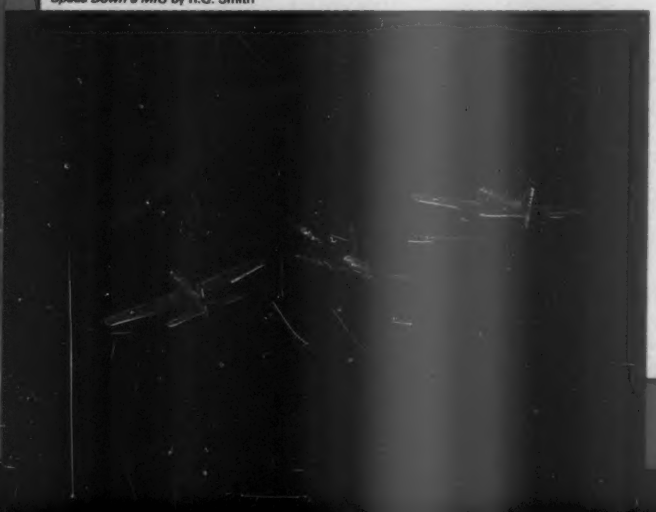
The penalty for not knowing the extreme ranges of your aircraft's capabilities, combined with your own skill, courage, talent and aggressiveness is a wrecked airplane and sometimes a dead pilot.

BrigGen. Robin Olds, USAF (Ret.)

F-15s Over the Bekaa by Blake Morrison

Alone on an FCF in his P-38 over Port Moresby, Lt. William Sells sighted a formation of over 100 Japanese aircraft. Naturally, he attacked. In the wild hassle that followed, Sells downed six of the enemy, flaming the last one with a single-engine head-on gun pass. Out of ammo, wounded and with one engine on fire, Sells was somehow able to disengage from the now disorganized Japanese. Lt. Sells was than killed when he crashed on a single-engine wave-off when mobile control sent him around.

Maj. Ed Cobleigh
Fighter Weapons Review



Speds Down a MiG by R.G. Smith

Aside from an annual attempt to qualify in air-to-air gunnery, any combat training in tactics was frowned upon for reasons of flying safety and nobody being willing to bite the bullet and give a requirement for it in peacetime. In short, it was catch as catch can and hope you weren't put on the carpet.

Col. Ralph S. Parr, USAF (Ret.)
10 Kills Korea Mar '79

Training after the war took advantage of lessons learned until safety considerations influenced training. . .

Col. Ralph Gibson, USAF, 1979

The tail wheel on his Spitfire did not retract, and on takeoff, Mick Lambert picked up a telephone line on his tail wheel. When his wingman, Lee Gover, joined on him, he noticed the 150-200 feet of wire trailing from his tail wheel. Spitfire radios were poor at best, so when he called Lambert to inform him of the wire on his tail, all Lambert heard was "on your tail" and took it as a call of a "bogie" on his tail.

"Well, you never saw a more beautiful instant aerobatic show in your life. After he had settled down and we were about to leave the convoy, I called again and said, "Red Two, you have a couple hundred feet of cable on your tail." Once again, he only heard "You have a couple — on your tail." The air show was on once again.

"When we landed back at base, he wondered why in hell I hadn't come to help him fight off the Luftuaffe instead of flying along straight and level watching him."

The Eagle's War
The Saga of the Eagle Pilots
1940-1945

Lee Gover
Mick Lambert
133 Squadron (RAF) Eagle

There is nothing magic about 5,000 feet that will keep you from busting your butt... if you depart controlled flight trying to keep from going through that 5,000-foot restriction, you may not make it... that very thing happened to two good friends at Udorn. They weren't hamburgers, either. Both had two kills to their credit.

Major Richard Hardy
Fighter Weapons Review

Olds Scores a Kill by Blake Morrison

Since HQ looked the other way and considered air-to-air excellence to be achieved by some process of magic — no, safety was not overly restrictive — mainly because we did not pay much attention to the many rules that did exist.

BrigGen. Robin Olds, USAF (Ret.)

Know the "Big Three." Be familiar with glide characteristics, air start procedures, and fuel consumption at altitude and at idle R.P.M. If you are attacked on the way home, you may need all three to make it safely.

Maj. Frederick C. "Boots" Blesse, 1954

Flying Tigers by Stan Stokes

Training Rules

(Formerly Rules of Engagement)

FM CNO Wash., D.C. 011159Z Sep 88
Interim Change to NATOPS General Flight and Operating Inst. 3710.7M,
Paragraph 536

Unscheduled simulated combat between naval aircraft or between naval aircraft and aircraft of any other service or registry is prohibited.

Tom

- Prior to commencing ACM maneuvering, fixed-wing aircrews shall perform a "G" awareness maneuver. If an aircrew experiences G loss of consciousness (GLOC), the flight shall immediately terminate and that aircraft shall return to base.
- Departure and spin recovery procedures shall be covered for all ACM participants during the preflight brief.
- Face-to-face brief shall be conducted by ACM participants (unless waived IAW applicable directives). In the event participating units are not co-located; a memorandum of understanding, a message or telephone brief or a pre-exercise brief between units may satisfy this requirement.
- Always assume the other aircraft does not see you.
- Maintain 500 feet separation from all other aircraft.
- During forward quarter or head-on pass (TCA>135 degrees) both aircraft maintain established trend. If no trend exists, each aircraft give away to the right to create a left-to-left pass. Single frequency-broadcast intentions if direction of pass is in doubt. Dual frequency-exaggerate aircraft movements to ensure other aircraft recognizes your intentions.
- Up-Sun aircraft has responsibility for maintaining flight separation. If Up-Sun aircraft loses sight, he will broadcast "Lost sight" and maintain predictable course. If Down-Sun aircraft loses sight, he will break off the attack, lag the Up-Sun aircraft and broadcast "Lost Sight."

● During descending pursuit, offensive aircraft shall monitor defensive aircraft's altitude/attitude and break off the attack prior to either aircraft descending through applicable altitude deck.

● Nose high goes high. If flight paths converge nose high aircraft goes "high" unless unable to energy state or aircraft performance. Nose low aircraft has the responsibility for maintaining flight separation.

● No blind lead turns. Lead turns conducted while on converging flight paths that causes the attacking aircraft to lose sight are prohibited.

● No flares approaching guns. With an offensive aircraft approaching gun parameters, offensive aircraft shall not dispense flares as part of a gun defense or as a distraction.

● 9,000 feet minimum range for forward quarter missile attacks — all fixed-wing forward quarter missile attacks (within 20 degrees of the target's nose) will be broken off at a minimum of 9,000 feet. Inside 9,000 feet, the pilot's undivided attention will be devoted to maintaining flight separation.

● 1,000 feet minimum range for gun attacks — fixed-wing gun attacks will be broken off at a minimum of 1,000 feet. Gun attacks in excess of 135 degrees track crossing angle (approaching head-on) are prohibited.

● All ACM participants must have two-way radio communications. Multiplace aircraft must have operable ICS.

— All aircraft monitor guard

— Single aircraft vs. single aircraft monitor common radio frequency

— Multiple flights — two or more aircraft engaging one or more aircraft may operate on separate frequencies if, each flight is under positive radar control.

— Nordo aircraft rock wings and assume one G flight. When witnessed, engagement shall be terminated.

Weather Criteria

All ACM engagements shall be conducted in daylight VMC conditions using the following criteria:

- No ACM into or through an overcast or undercast.
- Top of undercast or broken cloud layer is the simulated ground level.

Fixed-wing vs. Fixed-wing (OV-10 vs. OV-10 as well)

- ACM shall be conducted with at least 2,000 feet vertical and one nautical mile horizontal separation clouds at all times.
- Five miles minimum visibility with a defined horizon.

Fixed-wing vs. Helo

- Minimum ceiling of 3,000 feet AGL.
- Five miles minimum visibility with a defined horizon.

Helo vs. Helo/OV-10

- Minimum ceiling of 1,000 feet AGL.
- Three miles minimum visibility with a difined horizon.

Altitude Restrictions

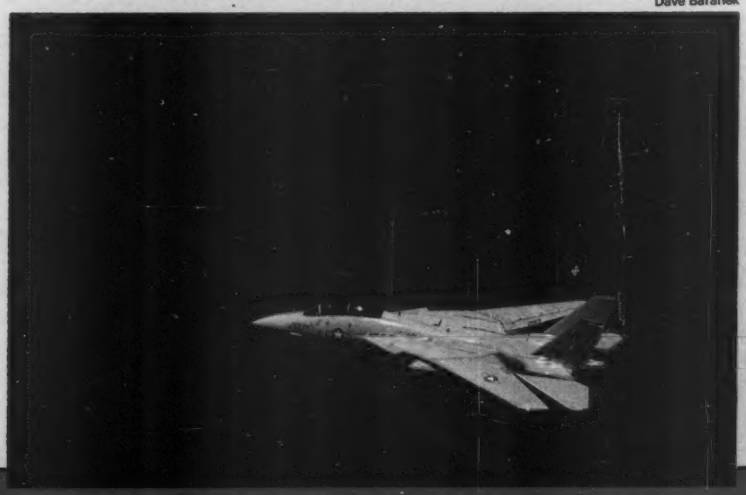
Fixed-wing vs. Fixed-wing

No sustained maneuvering below 5,000 feet AGL (hard deck) adjusted for cloud ceiling or terrain (i.e. with a 4,000-foot undercast or 4,000-foot terrain, the hard deck shall be adjusted to 9,000 feet).

High angle of attack (AOA) slow speed maneuvering shall be terminated passing through 10,000 feet AGL (soft deck) no guns defense below soft deck. Offensive and defensive maneuvering below the 5,000-foot deck.

- min altitude 500 feet AGL not low alt qualled.
- min alt 20 feet AGL if low alt qualled (unless waived).
- 180 degrees maximum turn.

Dave Baranek



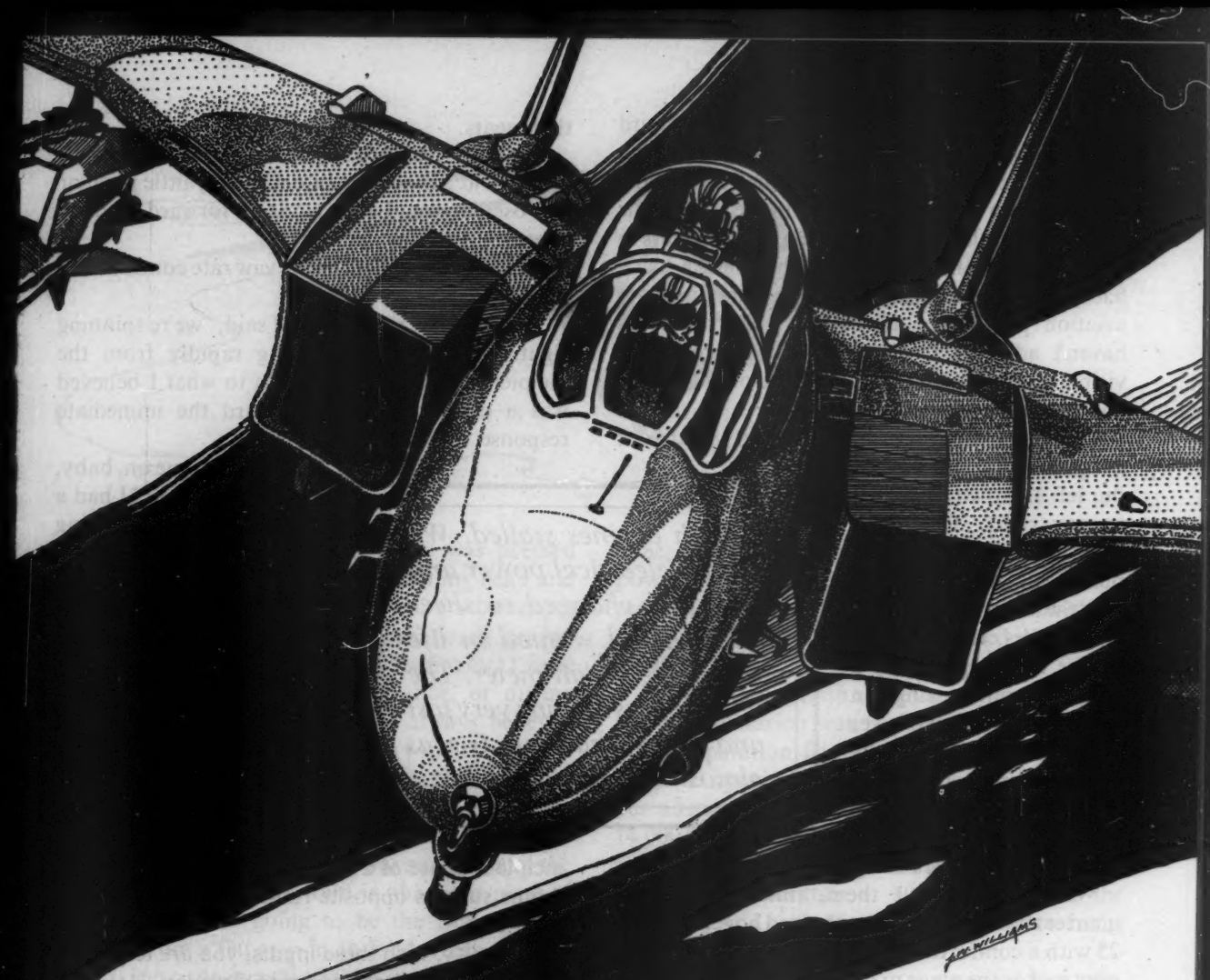
Fixed-wing vs. Helo
Helo vs. Helo/OV-10

No fixed wing high AOA/slow speed maneuvering below 10,000 feet is allowed.

Minimum altitude

Helo vs. Helo	100 feet both A/C
Helo vs. OV-10	100 feet both A/C
Helo vs. F/W*	100 feet (Helo)/500 feet (F/W
Helo vs. F/W**	100 feet (Helo)/1,000 feet (F/
OV-10 vs. OV-10	3,000 feet both A/C
OV-10 vs. F/W	3,000 feet (OV-10) 5,000 (F/W)

*Low angle 0-10 degrees
**High angle>10 degrees



to remember and was anxious to get the first hop of the cruise under my belt. My pilot was a second- tour lieutenant — an ex-Topgun instructor with the kind of professional experience and tactical expertise junior aviators dream of attaining. The brief was thorough, almost exhaustive. The aircraft logbook looked clean and preflight was normal. The launch was delayed for 30 minutes for an emergency pull forward for a sick Tomcat recovering early. That delay meant that we would launch and tank at dusk, with the AIC and carrier landing at night. No problem, basically a hop to check out the system and get a night trap. *Just another night AIC hop.* The first two intercepts were standard, comfortable flythroughs. The radar looked great, and we maneuvered to make a third run. Our section took the

northern station and was vectored southwest toward the ship. The pinky sunset was almost gone with a visible horizon in all directions: the time of the evening when an aircraft is hard to see without its lights, yet a little too bright for the aircraft lights to significantly stand out against the pinkish-black background. I had heard about these conditions in aviation physiology; they mean that your eyes haven't adjusted to the darkness. There was a visible undercast with the bottoms around 800 feet and the tops around 2,500 feet.

The third intercept went normally with our wingman starting out on our left and then switching to our right. The radar showed two bogies in a pure trail at 24,000 feet with the trailer slightly high. At 12 miles, I took a lock on the lead bogey using a range sort with my wingman and heard "Tally two" over the ICS. I also had tally two. Because we took a cut to the south to set up a right-to-left pass, the bogies appeared to be stacked right, and level.

Both engines stalled. We lost all electrical power and our calm changed to sheer panic. All I wanted in life was to see the altimeter. The horizon was moving very fast and the eyeball-out G was almost incapacitating.

We climbed above them, simulated forward quarter shots, and flew past the lead bogey at angels 25 with a comfortable abeam separation. I felt my pilot jockey the plane to prosecute the trail bogey as I padlocked the lead bogey who was moving to my 8 o'clock position.

After I thought the trail bogey had passed down our left side, I got ready to set up another intercept on the UHF. I was still padlocking the lead bogey and felt a series of stick movements I thought were attempts to take a simulated shot. I then felt moderate Gs and buffet followed by a sudden, violent right roll and yawing slice downward for about a turn and a half. The nose then pitched violently back to the horizon.

Going hot mike, I screamed over the ICS "Lock your harness!" The pilot replied his harness was locked, an important procedure in a potential spin. The F-14 can develop severe yaw rates very quickly forcing the aircrew out of their seats and into a poor position to initiate control inputs. Any hope of recovering the aircraft required the crew to be mechanically restrained in their seats.

The nose seemed to stay on the horizon, yawing to the right at a moderate rate with very little pitch or roll oscillations. I called, "Stick forward, neutral lateral."

"Roger," he replied, as the yaw rate continued to build.

"Left rudder, right stick," I said, "we're spinning right." We were progressing rapidly from the incipient phase of a right spin to what I believed was a classic flat spin. I heard the immediate response.

"I got it in. Come on, baby, recover, come on!" I had a good visual horizon using the pink glow to the west, and I was almost positive we were in a right spin. I had not noticed any turn arrow on the TID. With the pilot's last call, I was reasonably sure we both agreed we were in a right spin and that the controls were in the proper position. The F-14 can be recovered in the incipient phase of a flat spin with timely anti-spin inputs such as opposite rudder and stick into the turn needle.

In reality, with these inputs, you are telling the aircraft to spin in the opposite direction. However, there has been no record of an aircrew recovering a Tomcat from a fully developed flat spin. The question now was were the controls put in fast enough? Our altitude seemed to waiver at 24,000, and then our rate of descent picked up as I called out 23,000 and 22,000. At around 22,000 feet, I saw the lights go momentarily off, then on. Looking in the front seat, I saw both stall warning lights flashing. Thinking we had lost both engines and were now on the emergency generator, I tried to switch to guard and called, "Mayday, Mayday, 104, Mayday!"

My call was stopped in midtransmission by a complete electrical failure, and a deathly quiet. Black cockpit, no radio, no ICS, or lighting. The F-14's engines are notoriously prone to stalling, sometimes for no apparent reason, and they upheld their reputation this time.

The F-14 was spinning rapidly to the right,

having gone 4-5 turns. My body was pressed forward by 3-4 eyeball-out Gs with my head and shoulders wedged against the DDD (radar scope) and the top of the canopy. Needless to say, my lap belts were not cinched down. Normally, I only cinch them hard before a cat shot, or during ACM, and then loosen them. I always believed these were the only conditions in which I could be forced out of my seat and into a poor ejection envelope.

This was supposed to be a routine night hop, right? Our crew coordination was smooth, and the spin recovery controls were in the right place. I thought we were going to be the first crew to recover from a flat spin in an F-14. Heck, we had 14,000 feet to do it in (NATOPS says the minimum envelope for ejection from out-of-control flight is 10,000.) However, both engines stalled, we lost all electrical power, and our calm changed to sheer panic. All I wanted in life was to see the altimeter. By now, the horizon was moving very fast, and the eyeball-out G was almost incapacitating. In retrospect, I would now estimate the G to have been around 5, and the yaw rate about 180 degrees per second.

I grasped the handle above the DDD and pulled as hard as I could, putting my face right on the altimeter and airspeed indicator in a desperate attempt to read them. No luck. I learned later that my pilot had completed the rest of the NATOPS procedures after the ICS went out by shutting off the right engine (saving it for a re-light if we got out of the spin), and getting the stick into the turn needle and aft.

The aircraft was in a flat spin, with both engines gone, and (consequently) no hydraulics or electrical power. The time had already come to leave. I reached over with my right hand, jettisoned the canopy, and a second later, pulled the lower ejection handle with my left hand.

I saw a blinding flash as the canopy came off, and the next sensation was the seat being kicked off during separation. I did not reach full consciousness until the opening shock of the parachute. I guess our altitude at ejection was between 10,000 and 14,000 feet, and the number of turns in the spin was around 12. I looked down at the cloud deck and estimated my altitude at 10,000 feet above the undercast, so I knew I had at least 10 minutes in the chute.

I learned later the mishap was caused by a near midair collision with the trail bogey. Anyone in the aviation business who has not only been confused at night trying to judge relative motion by just looking at light patterns, but probably scared to death. If he says he hasn't, he's a liar. Even a controlled situation like rendezvousing on a tanker at night can be very disorienting. Lights can be dangerously deceptive in a dynamic situation. I had wrongly assumed that our pass was left to right, when the pass was actually right to left.

In order to avoid the other aircraft, my pilot jinked when he thought we were level and going away from the oncoming Tomcat. He was, in fact, pulling down and into the F-14. This created the illusion of the other F-14 jinking into us. Fearing an immediate collision, my pilot made a last ditch rolling pull to the left and down. This induced a coupled departure to the right, precipitating an almost immediate, irrecoverable flat spin, as well as

causing both engines to stall simultaneously. During this whole evolution, I was looking behind us.

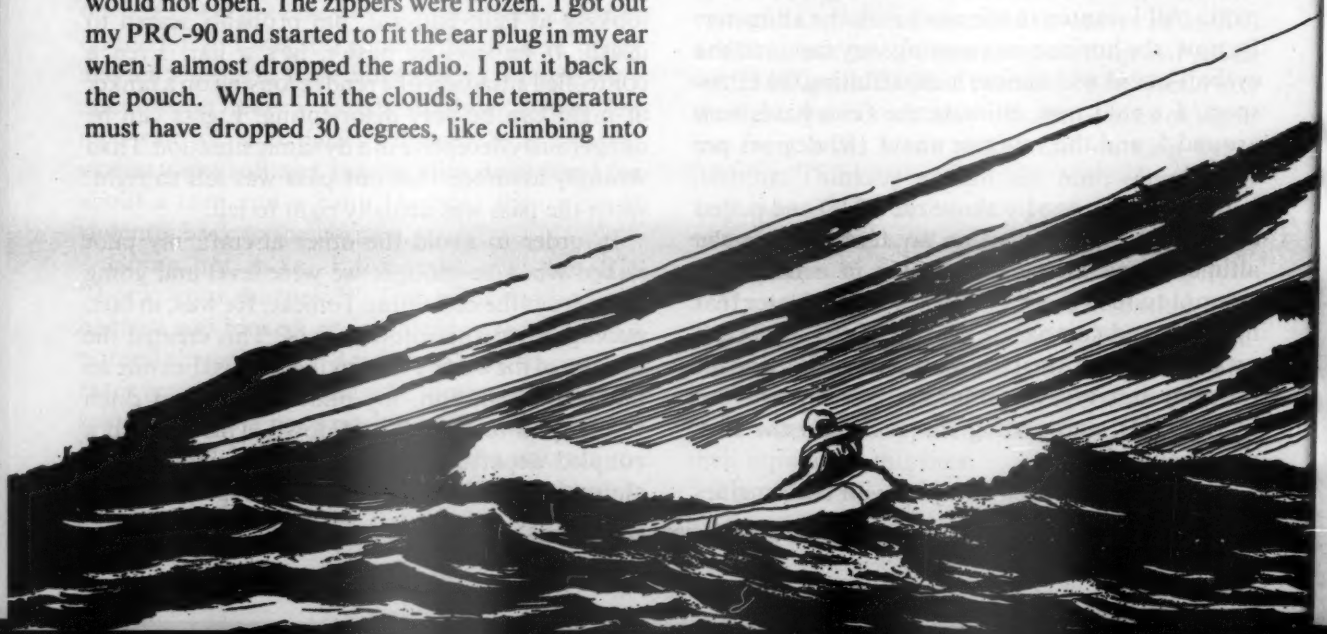
The first thing I did, once in the chute, was to make sure I was okay. I always felt that being 6 feet 4 inches tall, I might leave part of myself behind if I had to eject, but Martin-Baker performed as advertised, and I couldn't find anything wrong. Of course, my blood content was probably 50 percent adrenaline. Then, I released my seat pan — maybe too early. As soon as it dropped, and my raft inflated, the wind caught it and tossed it around wildly, and I began to fear that the lanyard would break. I went over IROK and inflated my LPU (life preserver), stuffed my gloves into my SV-2, took off my oxygen mask and located my kochs. I did not release my four-line release. I was oscillating badly at this time, and I probably should have. I could say that NATOPS says not to at night, or that I wasn't sure I had a good chute, but the fact was I had a real aversion to letting part of my canopy loose. Besides, I thought, I didn't need to steer anywhere. Looking back, I should have deployed the four-line release because the oscillations and swinging were very disorienting and demanded a lot of my attention in the descent. Also, the inflated LPU was immobilizing. I recommend inflating your life preserver immediately. Be advised, however, that most of your freedom of movement will be taken away.

My game plan was to get ready for water survival once I entered the clouds. In the interim, I inventoried my SV-2 but found my two side pockets containing my strobe light and other valuable gear would not open. The zippers were frozen. I got out my PRC-90 and started to fit the ear plug in my ear when I almost dropped the radio. I put it back in the pouch. When I hit the clouds, the temperature must have dropped 30 degrees, like climbing into an icebox. About two minutes later, I popped out underneath into total darkness, and, as the light faded, so did my confidence. I knew the bottoms were around 800 feet, and I anxiously waited those last 40 seconds, the longest 40 seconds of my life.

I had relocated my kochs once I came out of the clouds, and I cautiously slid my fingers under the release mechanism. I heard the waves but still could not see the water, and stared straight ahead at an imaginary horizon until my boots hit the water. I immediately released the parachute, not waiting for SEAWARS to release me automatically. I released my seat pan (forgetting to secure the raft to my D-ring) and climbed into my raft. Immediately, I took my helmet off and broke out the PRC-90 and tried to call my pilot on 282.8. His reply that he was OK was probably the best words I've ever heard. Then, I went on guard and gave another Mayday call with our approximate position, and started communicating with the helicopter. They told me to go to beacon. I complied because my radio was weak and garbled, and went to work loosening the zippers on my SV-2. I finally managed to get my strobe out, but lost my helmet when it washed away. I was forced to hold the strobe in the air.

The most valuable survival item in the SV-2 at night is definitely your flashlight. Remember, it is not tied on. I fired off one of my pencil flares hoping that my pilot could see it. He didn't, but the helicopter did. At one point, I looked behind me and saw my parachute floating just a few feet away. Fearing entanglement, I frantically paddled away.

From the time I entered the water until about this



point, I had been fairly comfortable. But, as the adrenaline wore off, I realized I was very cold. I was not wearing any protective clothing except my flight suit. The 5- to 7-foot sea state constantly washing cold water into my raft didn't help. After about 20 minutes, I switched back to guard and heard the helo talking to my partner; and a couple of minutes later, I saw the helicopter hovering on the horizon. My radio was weak, but I managed to pick out that they were hovering over the pilot.

I was not sure if they had seen my strobe, so I put on a mini fireworks display with my pencil flares and MK 13 day/night flare. I was so cold that I would do anything to make them come pull me out of the water. Finally, the helo radioed they had me in sight and to "conserve your resources." I guess I did get carried away.

Once they headed toward me, they told me to climb out of my raft. They'd be over in five minutes. I thought they were crazy. I'd get out of my raft when they were overhead — if then. That had to be the second longest period of my life. The rescue was uneventful, and the swimmer even found my helmet floating nearby. Hats off to the helicopter crew —they were great.

I learned more lessons in this mishap than I could put down in this already-lengthy story. The most important one is that *every* hop is a tactics hop and should be treated as such. In the F-14 community, we are used to pushing the envelope and performing to our absolute maximum during ACM, low levels and gunnery. But other hops, especially off the ship at night, tend to be far more docile (the mission, not the ensuing night trap) and don't require such a heightened awareness of high AOA maneuvering or spin procedures. I think this story proves that all hops require the same attention and preparation.

We made mistakes during this hop. Altitude blocks that could not be violated should have been briefed. Certain stability augmentation systems (SAS) that help the aircrew control the aircraft were left on for this hop — specifically roll SAS. It would have been turned off for a tactics hop but since this was just an AIC hop, it was left on. The bottom line was that we lost an aircraft.

The F-14 has queer characteristics when it departs normal flight. It insidiously and quickly builds a yaw rate that can be disastrous. Roll SAS severely aggravates this departure by making that yaw rate build even faster.

Stir together many unrelated factors — first hop of cruise, benign mission, disorienting lights at night, roll SAS on —add aircraft departure, both engines stalling, flat spin, and you get two good chutes and a lost aircraft. The use of roll SAS in nontactical hops is being re-evaluated in our squadron and probably should be in the entire Tomcat community.

Whether you fly an F-14 or T-34C, there is no room for even a shred of complacency. I don't think that it was a major causal factor in this mishap, but, then again, it was *just another night AIC hop.* ◄

Lt. Wood is a RIO with VF-1.

We'd like to thank all the people who contributed to this special issue of Approach.

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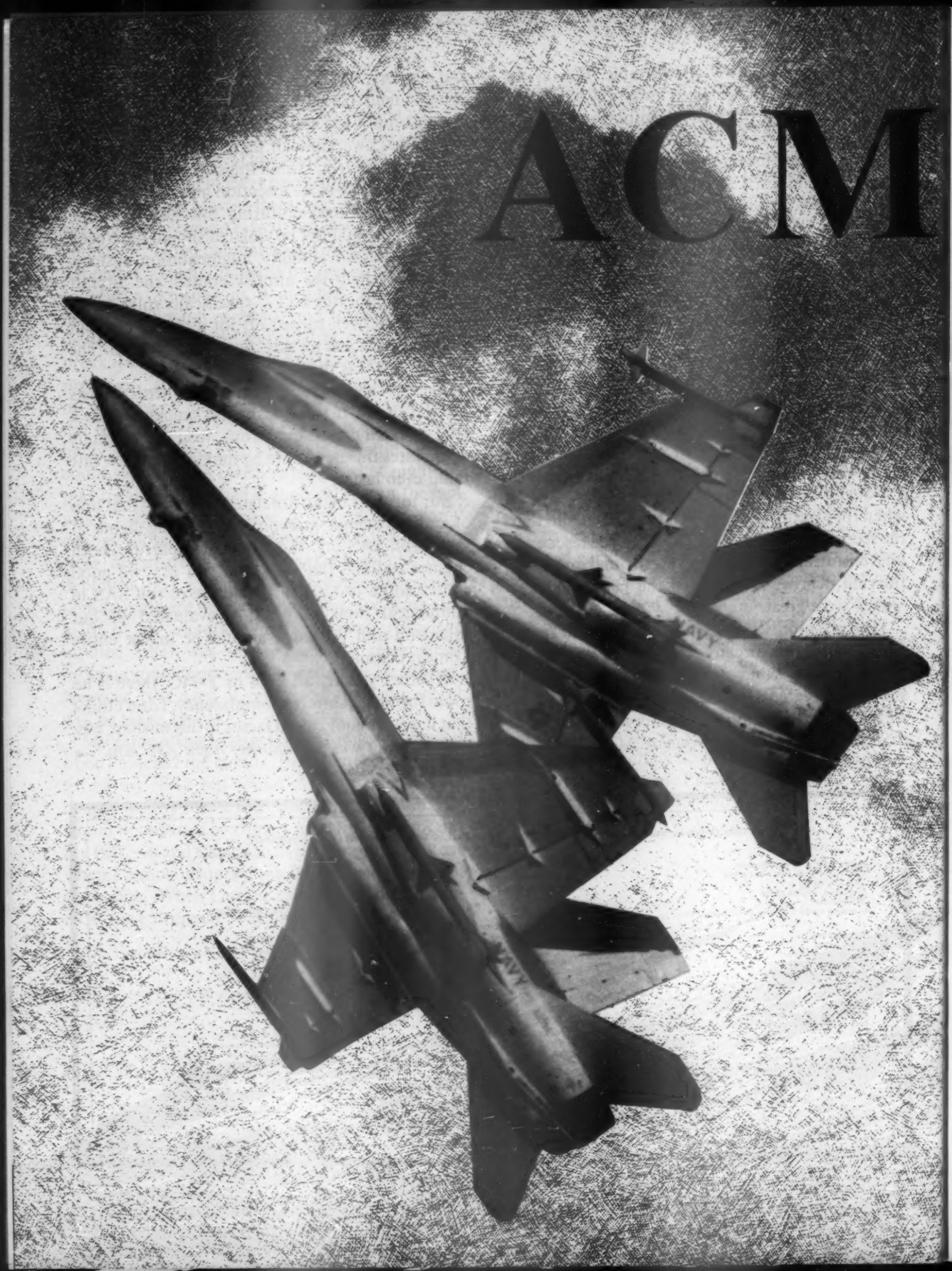

ACM

Midair

By Lt. Jeffrey R. Penfield

. . . The bogey may have seen me now; the angles were building. It was going to take a nose-high move to get to his six. Where was the flight lead? Time to make my move. Little right stick from my left turn to get my nose up. Hornet close, real close. Had to pull up to miss him. He was pulling, too. Had to push. Impact! . . .

OUR brief was followed by a normal start up, taxi and launch. The mission: 1 v 1 v 1 similar, F/A-18s. Kill criterion was guns only. Our goal was to practice engaged maneuvering in a multibogey arena. A 1 v 1 v 1 scenerio is especially demanding because it tends to be 1 v 2 for each participant. As you select an opponent, you can never forget the third player who may be after you or the other fighter.

We proceeded to the area in fingertip formation, then separated on three different compass headings before turning back into "fight center." I was tapped by the flight lead, which put me on the defensive. After several turns I executed my best gun defense, I thought, as my flight lead rolled away from my six. Where was the other guy? I projected him south, and I continued my left turn in that direction.

Looking for him, checking six, applying the four-second rule. No tally, no radar contact. Ah, tally ho, right 4 o'clock, about four miles. I turned in that direction to pursue. I don't think he saw me. "Knots coming up. Gotta watch for the flight lead," I thought.

He pitched off right so I knew he was behind me somewhere. As I reversed my turn, I kept looking, kept pursuing. The bogey may have seen me now; the angles were building. It was going to take a nose-high move to get to his six. Where was the flight lead? Time to make my move. Little right stick from my turn to get the nose up. All of a sudden I saw a Hornet close, real close. I had to pull to miss him. He was pulling, too. Had to push. Impact!

Was this happening to me? Lights, tones, negative "g." I was out of control and couldn't focus. The plane was not flying, and I didn't want to be in it when she exploded. Right hand on the canopy to get my butt in the seat. I found the handle with the other hand and pulled. Wham! I was out of there. I was falling now, falling too long. Manual release, opening shock. Whew, what a jolt! Good chute followed by IROK. A 10-minute ride in the chute, and it was water survival time. Just like Pensacola, in the raft, PRC-90, ate my Chiclets. I was picked up 35 minutes later for a long ride back to the beach in an H-3.

The total time of the incident was just over an hour, and it changed my approach to flying and training. I always trusted my instincts and perceptions and reacted on the perceived situational awareness. I knew my flight was behind me somewhere. I knew the guy I was currently running on was the other member of the flight. I knew my scan needed to be concentrated from my 3—9 line back, again because I knew he was there. I found out the hard way that what I knew was completely wrong. In fact, the aircraft I collided with actually came in from abeam and was not my flight lead at all. It was the other guy.

Don't assume anything! Everyone's been there. You project flight paths, form a mental picture and react to it. The picture formed that day was an improper one. And it was costly. If you don't have tally two, don't think you have the situation suitcased. Look for the other guy everywhere, not just where you think he should be. Things are too dynamic to make assumptions.

Our survival training is the best there is. My squadron mate and I survived the impact on sheer luck, and our survival training took us the rest of the way. Everything we did from the ejection on was just what we were trained to do. Thank Pensacola for that, and our riggers and AMEs for enabling us to get to that point. You won't find me bored at any survival lecture. Trust your training and use it. It'll be there when you need it. ◄

Lt. Penfield is quality assurance officer for the VFA-136 Knighthawks.

Maverick's MIR

By LCdr. Dave Parsons

Tom Twomey

Through numerous interviews with squadronmates, AMB determined the MP possessed a high degree of aviation prowess exceeded only by his flagrant disregard for rules and his unpredictability.

"TOP GUN" refers both to a place and a movie. One is very real — the Navy Fighter Weapons School. The other is a hit movie, a bit of fiction based on fact. Even though it is fiction, the movie has foundation in more truth than meets the eye. Take "Maverick's" mishap. One thing that wasn't in the movie was the MIR (Mishap Investigation Report) from the mishap. This omission is entirely understandable since the movie ended before your average AMB (Aviation Mishap Board) could produce the report. The MIR probably couldn't be adapted to screenplay anyway, because it is often very dry and contains privileged information. Viewers of "Top Gun" had to settle for a "Board of Inquiry," which exonerated Maverick of any wrongdoing.

The movie was a fantastic boost for recruiting, but there are those who feel it dealt a severe blow to naval aviation safety. Those who feel that way are worried that Maverick's attitude and actions are poor role models for impressionable junior officers. Nevertheless, even without the MIR, the movie did make some worthwhile points about safety and ACM, both directly and indirectly.

What follows are excerpts from a fictional MIR endorsement that probably would have resulted from Maverick's mishap. These points can serve as useful discussion items for the real world.

1. This endorsement concerns a severe hazard to naval aviation. Navy Fighter Weapons School endorsement requested IAW Reference A and C. Summary: Aircraft departed controlled flight during air combat maneuvering training mission and impacted ground.

2. Concur with the conclusions and recommendations of Reference B, except as modified below and with additional comments.

A. Mishap causal factors:

(1) Aircrew error pilot. Violation of SOP/Training rules. RAC IIB. Concur. Aircrew closed within 500-foot bubble in violation of training rules. MP's desire for a "kill" clouded his judgement, and despite protests from his RIO, pressed too close (40 to 50 feet) setting him up for an out-of-control flight situation due to jetwash. Mishap aircraft flew through wingman's jetwash causing starboard engine to stall, which induced yaw rate, subsequent departure, loss of port engine and eventual flat spin. Although jetwash is unseen and hence unavoidable in most cases, MP was in close proximity to flight lead during a dynamic flight regime in violation of clearly understood training rules. Although MP states it was solely his decision to press the attack and ignore his RIO's objections, statements from squadronmates indicate that this violation was a common practice by this aircrew even in real-world intercepts. In fact, mishap aircrew was counselled after first Top Gun sortie for violation of 10,000-foot hard deck. In this case, had better judgement been shown and training rules observed, this mishap would not have happened. Quite clearly, MP should have never been there in the first place.

(2) Aircrew error pilot. Failure to comply with NATOPS procedures for upright departure/flat spin. RAC IA. Concur. MP was either unable to effect proper control inputs or applied improper controls thus aggravating the departure and allowing it to rapidly progress to an unrecoverable flat spin. Analysis of mishap indicates that due to violence of departure and rapid entry into flat spin below mandated 10,000-foot ejection altitude, control inputs would have not been effective in restoring aircraft to controlled flight within altitude remaining.

(3) Supervisory error. CO failed to instill proper flight discipline in MP. RAC IIB. Concur. Through numerous interviews with squadronmates, AMB determined that MP possessed a high degree of aviation prowess exceeded only by his flagrant disregard for rules and his unpredictability. Interviews revealed that CO was only aware of a small percentage of MP's transgressions. MP was grounded six times for low-altitude, high-speed passes, had his section lead qualification revoked three times and was put in hack two times in an effort to bring him into line. Squadronmates bear an equal responsibility in failing to arrest his aberrant behavior as they failed to bring instances to the CO's or Ops O's attention. Therefore, the CO was dealing with what he saw and what was reported to him, which was not a true picture. This tendency of squadronmates to not want to put a fellow aviator on report is not unusual, but in this case could have possibly saved a life and aircraft.

Continued

B. Damage/injury causal factors:

(1) Aircraft. Aircraft impacted ground after aircrew ejected. RAC IA. Concur.

(2) Aircrew. RIO initiated command ejection without first jettisoning the canopy as called for by NATOPS boldface emergency procedures. RAC IA. Concur. The reason for this is a likelihood that the canopy will float over aircraft and present an obstacle to the RIO's seat in its ejection trajectory. Mishap analysis indicates cause of death to MRIO was, in fact, impact with canopy.

That covers the meat of the mishap. The rest of the MIR would contain the normal verbage detailing what happened when and to whom and a few recommendations (the usual one about expediting the GE F110 engine and incorporation of ARI). The CO's comments in this endorsement would be interesting as he tackles the thorny problem of dealing with an outstanding stick and throttle jockey with a maturity problem and a squadron of junior officers that have a junior officer protection association (JOPA). Here's what the CO might say:

CO's endorsement — This pilot wasn't my best pilot. He could have been. He possessed unmatched flying ability, but at the same time had a character flaw that led him to continually do brash things in the air. He was closely scrutinized and disciplined. But as the AMB discovered, not close enough. It is a tragedy that his close friend (MR) and an aircraft had to be lost to cure him of his immaturity. I bear full responsibility for sending him to NFWS. Had I known the full extent of his activities, he would not have gone. The lesson for all COs and aviators alike is to ask yourselves — can this happen in my squadron? The MIR revealed that before this mishap, a fellow NFWS student accused the MP of being unsafe and dangerous. This was apparently well-known among his peers, but not communicated to anyone in a position to do anything about it. Commanding Officer's will always bear the burden of ultimate responsibility, but that doesn't remove the obligation of peers to be their brother's keepers. Failure to do so could place them in a position to be their brother's pallbearers. We've come so far in the fighter community in regards to refining our craft. The aggressiveness we extol has to be tempered with maturity and good common sense. We all share the responsibility of examining ourselves and our squdronmates to ensure this is so. It takes a lot of judgement calls, some of which won't be easy.

Even though what you just read is fiction, several Navy and Marine ACM mishaps are strikingly similar to Maverick's mishap. In one case, a pilot was trying to prove to the CO that he was the top junior pilot in ACM ability rather than a contemporary (sound a little like Maverick?) He was scheduled to fly an ACM hop as an aggressor against his contemporary and the CO. Undoubtedly, he saw the hop as a chance to demonstrate his ability. After the first pass, his aircraft departed and went straight into the water without any ejection. Investigation revealed he had turned off his Roll SAS and the Q-feel in violation of NATOPS in order to try to get more performance out of the Harrier. He got more than he could handle, and it killed him. The desire to be No. 1 can cloud your judgement to the point of putting the rules aside. The rules are there for a reason. Disregarding them can take you out of the game, permanently.
them can take you out of the game, permanently.

In another mishap, an F-14 aircrew continued to maneuver in a slow speed, high AOA condition below the hard deck of 10,000 feet (Maverick's first transgression at Top Gun). They departed controlled flight and ejected. Had they honored the hard deck, they would have had more altitude to effect a recovery. This particular mishap happened before the movie was released.

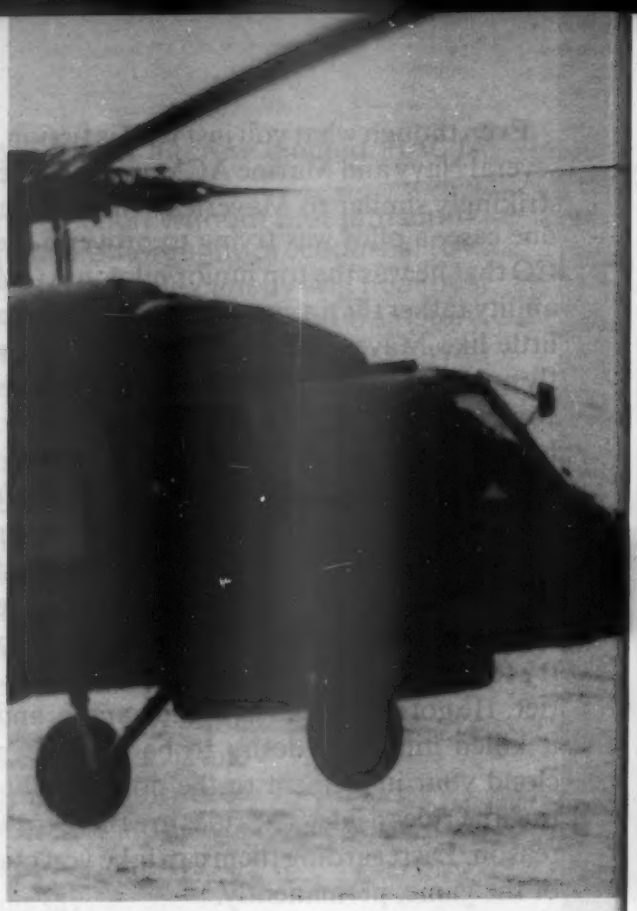
Did the movie spark a widespread cavalier attitude towards the rules? Some say yes. Others say the movie shows a clear-cut example of how a cavalier attitude, even fictionalized as it was, leads to disaster. Maverick finally wises up, gets the girl, gets some MiG kills and becomes a hero.

In real life, someone with his attitude might not be so lucky. ◄

LCdr. Parsons is the editor of Approach.

Top Helo

By Lt. Steve Wright and Lt. Rob Deluca



AN Michael J. Feidler

THE following is a transcript of actual cockpit communications and radio transmissions between the flight crew of a Navy SH-2F LAMPS (light airborne multipurpose system) Mk-I helicopter from Helicopter Antisubmarine Squadron Light (HSL) 37 (call sign Easyrider 59), and the air controller from the frigate *Badger* (FF-1071) during flight operations in the Sea of Japan in late August 1983.

"Easyrider Five Niner, this is Delta Three Echo control."

"Control, this is Five Nine, go ahead."

"Roger, Five Niner, I've got two bogies inbound on your three three five radial at 16 nautical miles, tracking one six zero, speed medium."

"Control, Five Nine, roger, we're looking."

"Five Niner, Control, bogies appear to be on an intercept heading."

"Control, Five Nine, roger."

"Senso, Tacco, you guys keep your eyes out of the aircraft back there."

"Check your harnesses locked and get the camera ready."

"Roger, sir."

"Tacco, Senso, I've got a tally, bogies on our 10 o'clock, level."

"Roger, tally."

"Control, Five Nine, we've got a tally on the bogies."

"Five Niner, Control, roger, can you V.I.D. (visually identify) the bogies?"

"Control, Five Nine, standby."

"They look like helicopters, Tom."

"That's what I thought, but not out this far."

"They're definitely helicopters, Tom."

"You're right."

"Control, Five Nine, bogies appear to be helicopters."

"Five Niner, Control, roger."

"Holy Christ, they're Hinds!" (NATO designation for Soviet Mi-24 helicopter)

"Control, Five Nine, looks like the helicopters are Soviet Hinds."

"Five Niner, Control, did you say Hinds?"

"That's affirmative."

"Tacco, Senso, bogies on our 9 o'clock; they're definitely Hinds, sir. They sure look awesome! Look at all those damn rockets."

"Roger, keep a heads-up; get plenty of photos."

"Roger, sir."

"They're separating; one of them appears to be climbing."

"Roger, all eyes on the bogies. Let's keep talking; I want to know where they are at all times . . . Let's maintain heading and airspeed and see what these guys are up to . . . !"

"Roger."

"Tacco, Senso, we've got a Hind overhead, about 1,000 feet above us now, in a slow turn."

"Roger."

"Pilot, Rescue, the other Hind is on our 6 o'clock now, real close!"

"Roger, how close?"

"Within a 100 feet."

"Roger."

"I've got him in the mirror, Tom; he's difinitely close."

"Roger, let's make a slow turn back to homeplate and see if he follows. . . . Give Control a call and let them know what's going on."

"Roger."

"Control, Five Nine."

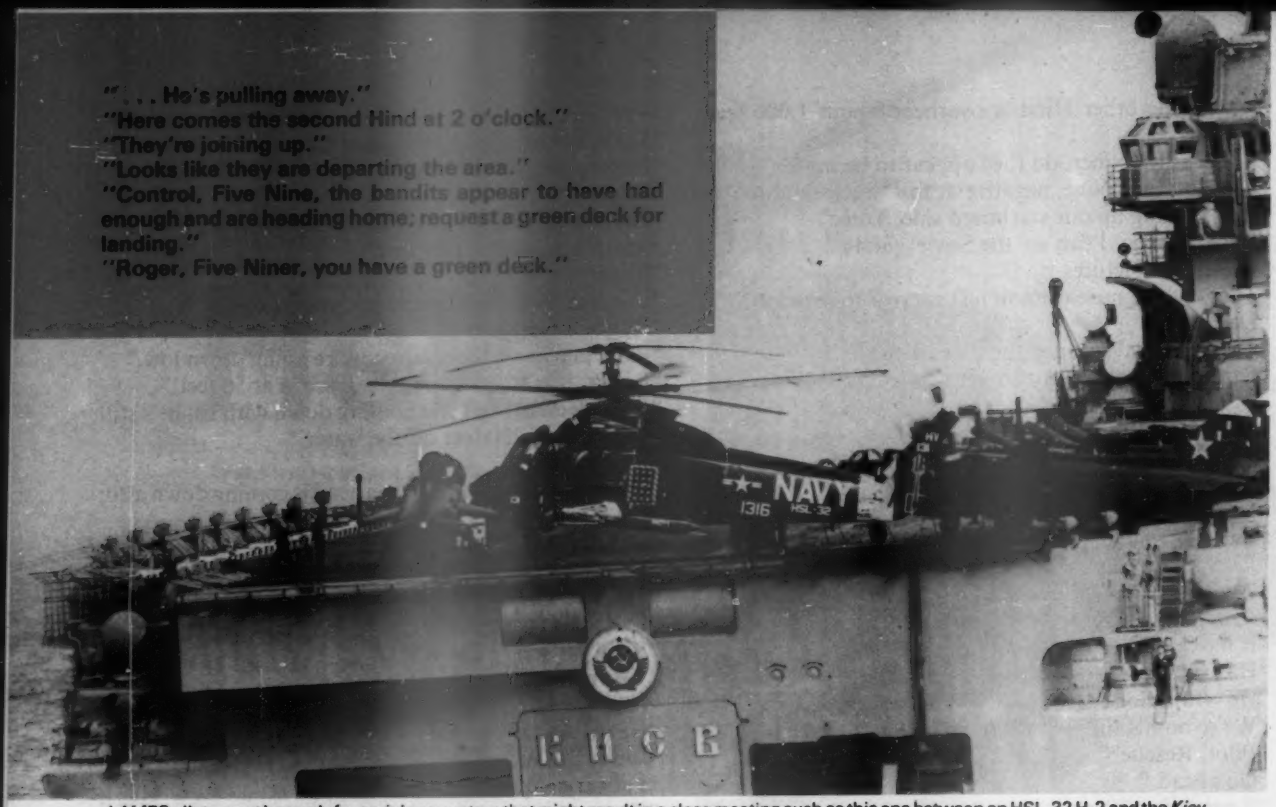
"Go ahead, Five Niner."

"Roger, Control, we're about 10 miles out, and we've got one Soviet Hind helicopter close aboard on our 6

o'clock; the other Hind is overhead about 1,000 feet above us."
"Roger, Five Niner, do they appear to be hostile?"
"Control, Five Nine, negative at this time, standby."
"He's coming up our starboard side, Tom."
"Pilot, Rescue, I can see the Soviet pilots."
"Roger, get pictures."
"Tom . . . the nose cannon just rotated towards us!"
"Damn . . ."
"They may have armed their weapons!"
"I think we should try to get this guy off of our six, Tom."
"You're reading my mind, big guy."
"You're clear left."
"Roger, coming left now."
"He's coming with us!"
"Increase your rate of turn . . . back stick, back stick!"
"Pilot, Senso, he's still on our six."
"Roger."
"Passing through one eight zero."
"It looks like we're turning inside of him."
"He's on our 9 o'clock now."
"He's 10 o'clock level."
"We're on his six! . . . We're on his six!"
"Pilot, Rescue?"
"Go ahead."
"Roger, sir, we've got the other Hind on our six now!"
"Roger."
"Clear right."
"Breaking right."
"Control, Five Nine, I'm currently eight miles out. I've got two Soviet Hind helicopters with possible weapons armed. I'm taking evasive action at this time, inbound to homeplate; request you standby to assist, over."
"Five Niner, Control, Roger, we're closing your position; we're at general quarters at this time, over."
"It looks like we can beat him by out-turning him, Tom!"
"Yeah, but he's definitely got more power than we do!"
"Homeplate, on the nose!"
"Roger."
"Let's come in low towards the ship, then see if we can pick this guy off of our six."
"Roger."
"Control, Five Nine, we've got you in sight."
"Roger, Five Niner."
"Back me up on the gauges; we're going down low."
"Roger, he's still on our six . . . we're at 50 feet."
"Pilot, Rescue, he's not coming down with us; he's still about 100 to 200 feet off the water."
"Roger."
"Tacco, Senso, the Hind overhead is coming down also; they're both behind us now."
"Roger, let's shake these guys."
"Forty feet and holding; after crossing the stern, break left and come up the starboard side of the ship."
"Clear left . . ."
"Breaking left . . . now!"
"We've picked them off!"
"Roger, come around the bow to the port side."
"He's doing a wingover and coming right back at us!"
"We've got one on our six again."
"Let's try a quick stop."
"Roger."
"Forty feet and holding; increase your airspeed."
"Steady, anytime you're ready."
"Roger, executing a quick stop . . . now."
"He's not stopping with us."
"He's rolling right, rolling right, at 5 o'clock now coming up our starboard side!"
"Got him."
"Break right now, now! Dump the nose! Get some airspeed!"
"We're on his six; we're on his six."

Lt. Rob Deluca briefs a HEVT hop at HSL-30.

AN Michael J. Feidler


". . . He's pulling away."
"Here comes the second Hind at 2 o'clock."
"They're joining up."
"Looks like they are departing the area."
"Control, Five Nine, the bandits appear to have had enough and are heading home; request a green deck for landing."
"Roger, Five Niner, you have a green deck."
NAVY
1316
HSL-32

LAMPS pilots must be ready for aerial encounters that might result in a close meeting such as this one between an HSL-32 H-2 and the *Kiev*.

This incident graphically stated the need for evasive maneuvering (EVM) training in the LAMPS community. The crew of Easyrider 59 had no training in EVM or ACM (air combat maneuvering) when they were set upon by the Hinds. They were forced to learn "on the job" relying on their own instincts and airmanship. Recent Persian Gulf experience, in which Navy helicopters have had to contend with a variety of airborne threats, has further substantiated the need for the LAMPS community to be smart on EVM. A carrier carries a lot of fighters, but the carrier may not always be close enough to the small boy with the LAMPS det to respond to a threat to the lonely LAMPS helo.

Today, LAMPS crews do not deploy without air-to-air experience. Since Easyrider 59's encounter, HEVT (hostile environment) training has become well established in the LAMPS Mk I community. The SH-60 community has also come on board with HEVT that includes EVM, low-level NAV, ACM and EW training as a package. Both HSL-40 and HSL-41 (SH-60), and HSL-30 and 31 (SH-2) Fleet Readiness Squadrons have incorporated HEVT into their syllabus training. All replacements going through the FRS receive HEVT training, so eventually all pilots will have the training. Each LAMPS det now deploys with a minimum of two HEVT trained pilots. If the det does not have enough HEVT-qualed pilots, the FRS will cycle the appropriate number of pilots through a ground school and flight syllabus to bring them up to speed.

The LAMPS community was able to come up to speed quickly by relying on the considerable amount of EVM experience in the Marine Corps. The Marine Corps has long recognized that any helo that flies in a potentially hostile situation has to be ready for an air-to-air threat, whether it be from another helicopter or a fixed-wing aircraft. The Marines have incorporated EVM/ACM into their helicopter communities through their Training and Readiness Manual, and WTI program. EVM is an integral part of the biannual MAWTS WTI exercises. The LAMPS community borrowed from the Marine experience and utilized MAWTS instructors to set up the FRS syllabus training and qualify the instructors. LCdr. Gervais Coryton, a Royal Navy exchange officer assigned to Helicopter Sea Control Wing One at Norfolk, also brought his experience with the Royal Navy's "fighter evasion" training to HSL-30's program. His personal experiences with EVM in the Falklands were an added benefit as well.

The foundation of success in ACM/EVM is a firm understanding of NATOPS and flight characteristics. ACM/EVM requires that the helicopter be flown to the edge of the performance envelope. Many maneuvers may be. The next time LAMPS pilots won't have to learn on the job.

Thanks to LCdr. J. Coryton, HELSEACONWING One; LCdr. Craig Diffie, HSL-30; and Lts. Jim Sullivan and Ken Ireland, HSL-40, for their assistance in preparing this article.

Lt. Wright was serving with HSL-37 at the time of his encounter with the Hinds. He then reported to HSL-30 as an instructor and helped initiate the HEVT syllabus there. He recently joined HSL-32. Lt. Rob Deluca is the HEVT phase leader at HSL-30. He previously served with HSL-36.

Lt. Wright authored a similar article under the same title for the USNI *Proceedings*.

TOP TRON?

By Ltjg. Jack E. Brinson, Jr.

. . . Mav incorrectly inputs anti-spin controls and enters a full-fledged spin. No chance, Paddles, and the ECMOs eject at 10,000 feet, leaving Mav still fighting . . .

NOT much notice was given to the recent release of "Top Tron." Set aboard an American aircraft carrier in the Mediterranean, Top Tron was a thinly disguised imitation of the smash hit, "Top Gun."

The film stars teen hunk Tom Overdrive as Maverick, a maladjusted, disgruntled EA-6B pilot, determined to make his mark. It featured the familiar plot of boy meets girl, rides big motorcycle (helmetless, no less) and is finally called upon to fly a special mission below the Gulf of Sickness's infamous "Line of Mirth." The dialogue was flat; the musical score was poor, and the constant bickering between the pilots and the NFOs (ECMOs) was boring. However, the climatic final flight scene was interesting.

Here's the scene: Mav and his crew of three ECMOs were well below the Line of Mirth, pounding away at radar sites. Suddenly ECMO No. 2 screams, "Mav, break hard left, bogey 9 o'clock, kinda low." Mav strains his fading 20/20 pupils, tries to decide where to look and finally picks out the silhouette of two MiG-23s pulling hard to his six. You can feel the tension in the cockpit as Mav sedately rolls the Prowler into a 30-degree angle of bank, a little nose low to gain speed. Naturally, Mav doesn't consult with his crew of his intentions as he continues to "arc" into the MiGs' line of fire. Secretly, Mav figures he can bait the fighters in a little closer and then escape with one terrific move and possibly send a HARM missile in their direction. No probability-of-kill he figures, but maybe he'll luck out and spook one of the pilots into ejection.

Finally, after seemingly endless hesitation, Mav figures the distance is right and throws in his best break turn, stick hard left, bottom rudder, the works. He wrenches the stick aft, as the g-suits inflate and two ECMOs' heads bang against the canopy. Mav should have worn his new glasses. He badly misjudges the fighter's distance, and the MiG hacks the turn. Mav desperately yanks the stick further aft, but the Prowler abruptly pitches up and reverses to the opposite side.

All three ECMOs simultaneously scream, "What the hell!" but miss Mav's expletives as the scanner simultaneously picks the wrong time to lock up on some North African tunes. NEUTRALIZE, NEUTRALIZE! The gyrations begin to break, but Mav incorrectly feeds in anti-spin controls and enters a full-fledged spin. No chance, Paddles, and the ECMOs eject at 10,000 feet, leaving Mav still fighting. The crash scene is spectacular as the MiG pilot does an eight-point victory roll over the three chutes. The VHS should be out in a month.

In anticipation of the public's reaction to the film, VAQ-129 has dusted off and revised its Defensive Air Combat Maneuvering (DACM) syllabus. Prowler crews can now expect to learn such fundamentals as energy conservation, proper lookout technique, distance judgment, proper crew coordination and anti-spin procedures. It's about time! With proper training and technique, the Prowler can be a survivable and safe platform in a hostile environment. ◄

Ltjg. Brinson flies with VAQ-132, an EA-6B squadron based at NAS Whidbey Island, Wash., and deployed in USS *Forrestal* (CV-59).

Moments From Disaster

By Capt. R.E. Joslin, USMC

IN 1981, a Marine UH-1N was lost, and one aircrewman was killed on an EVM sortie when the aircrew found themselves in an unarrestable rate of descent.

Following a left pop-up to gain advantage over the second Huey, the pilot found himself in a descending turn, with 70-80 percent torque, and an airspeed of 80-90 knots. Thinking he was in a settling-with-power condition, he froze the collective and tried to fly out of the condition by lowering the aircraft nose to increase airspeed. The helo impacted the ground, with the left rear skid sustaining the initial shock and breaking free. The right skid eventually broke free as well, and the UH-1 slid on its belly straight ahead for 100 feet before beginning a right roll. The main rotor blades struck the ground, and the aircraft became airborne. It traveled 30 feet while rolling 360 degrees, and struck the ground again on the right nose and forward cabin area. It cartwheeled back into the air, then fell back to the ground onto the left cabin roof and engine section.

The PIC unstrapped and helped his copilot away from the aircraft, then returned to help the crewman in the aft cabin. The crew chief, secured by only a gunner's belt, suffered fatal injuries. Analysis of the mishap revealed that the helo was not settling-with-power, but had merely overbanked and failed to compensate.

We normally do not associate "pulling Gs" with helicopters, and consequently, our lack of understanding of this phenomenon has been a contributing factor in past mishaps. It will be so in the future unless we educate ourselves about exactly what is happening to a helicopter maneuvering at high angles of bank. Other fairly recent mishaps involved helicopters operating at high angles of bank, close to the ground. The pilot at the controls was flying cross cockpit (flying from the left seat and turning right, or vice versa), resulting in the aircraft descending and hitting the ground. These mishaps were not ACM/EVM-related but reveal that many pilots don't appreciate the aerodynamics of high angle-of-bank flying close to the ground.

Let's look at the dynamics involved, starting from level flight (rotor thrust equals weight), and then rolling into an angle of bank while maintaining constant altitude and airspeed (Figure 1). We know from experience that to maintain this energy state requires an armful of collective. This is because of the increased thrust (manifested as collective position) required to provide antiweight (vertical) component when the thrust vector

is tilted from the vertical upon entering an angle of bank. That is, our apparent weight (G-loading) increases proportionally with the angle of bank when we add sufficient power to maintain flight in a bank without losing altitude or airspeed. To determine G-loading, take the inverse of the cosine of the angle of bank.

Representative angles of bank and their associated G-load are tabulated in Figure 2. Example: If we are in a 60-degree angle of bank, then we are pulling 2 Gs, which essentially means that we weigh twice as much as our straight-and-level gross weight. That is, if we increase our power sufficiently to maintain the same altitude and airspeed, but in an angle of bank.

What happens if we don't have the power available to lift twice our gross weight or if we don't apply collective immediately upon rolling into an angle of bank? Figure 1 shows that we no longer have an equilibrium of vertical forces, hence we accelerate downward in the direction of the unbalanced force. For illustrative purposes, let's assume we are flying at 300 feet AGL and roll into a 60-degree angle of bank while maintaining our airspeed, but without increasing our collective power. How long will it take before we hit the ground? Figure 3 plots the time to impact from various entry altitudes (AGL) and angles of bank, assuming no initial vertical velocity.

Actually, the plotted time to impact corresponds to when the altitude sensing port hits the ground, which obviously will be preceded by main rotor impact. This plot is independent of the type of aircraft or gross weight and is merely a function of angle of bank. Note that a partial application of power or a reduction in airspeed will increase the time to impact and, conversely, power reductions or increases in airspeed will decrease the time to impact. Also, any initial rate of descent present upon entry will decrease the time to impact, while any initial rate of climb will increase the time to impact.

Another factor, not considered, is the change in parasite power required due to a change in the area exposed to the free-stream flow when we go from straight-and-level flight to an angle of bank. For our example, starting at 300 feet AGL and rolling into a 50-degree angle of bank without any power adjustment while maintaining our entry airspeed, the time to impact is approximately six seconds — which is how long it took you to read this sentence!

A moment's hesitation in applying collective or distraction — due to radio communication, caution panel/warning light illumination, traffic calls, visual disorientation, or whatever — coupled with a failure to immediately satisfy the power requirements when rolling into an angle of bank at low altitude, will result in a downward acceleration that puts you just *moments from disaster!* ◄

Capt. Joslin is a helicopter aviator serving as the helicopter aerodynamics instructor for the Aviation Safety Programs at the Naval Postgraduate School, Monterey, Calif.

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Figure 1

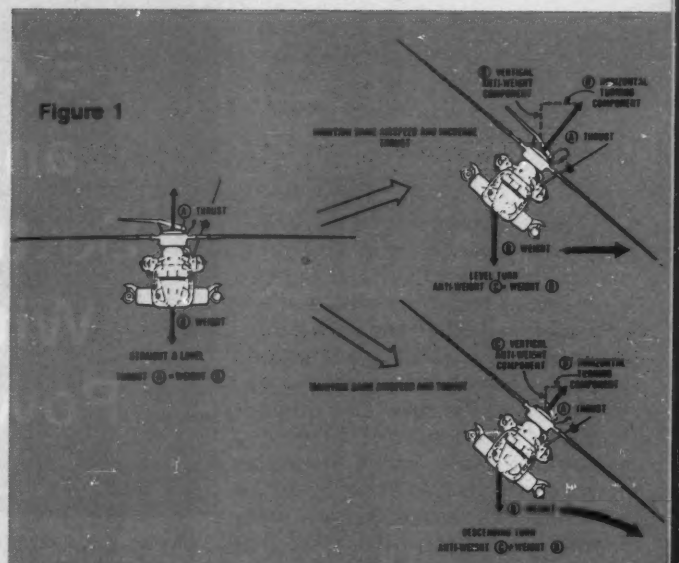
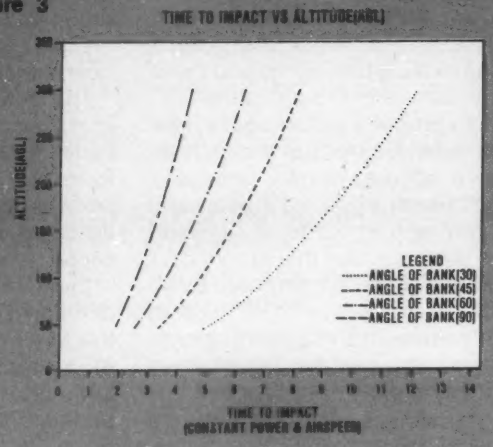


Figure 2

ANGLE OF BANK	★G LOAD
0	1
10	1.02
30	1.15
45	1.41
60	2.00
75	3.86
85	11.50
89	58.82
90	∞

★APPARENT WEIGHT WHILE MAINTAINING ALTITUDE AND AIRSPEED AT LISTED ANGLE OF BANK

Figure 3



EVM and Settling With Power

By Lt. Joe Anthony

THREE years ago, a Navy SAR UH-1N aircrew launched on a routine training flight and engaged in unplanned, unbriefed and unauthorized tail chase with a transient TH-57 operating at the same field. *Shortly before the Huey launched, the crew saw another SAR UH-1 engaged in tail chasing with the same TH-57. Since this second Huey was flown by the air station CO, the first aircrew probably (and erroneously) felt that the unplanned tail chase was OK.*

The first Huey took off into the wind, which was a gusty 30-35 knots, and accelerated to 90 knots. Engaging the TH-57, the UH-1 began a 30 to 40-degree angle-of-bank turn with a 30-degree nose-up attitude. The Huey reached an altitude of 300 feet AGL before starting a downwind descent at 500-800 fpm and groundspeed of 35-45 knots.

The UH-1 was now in a settling-with-power settling condition. At 50 feet AGL, the HAC responded to the impending impact with the ground with 100 percent torque while flaring the aircraft. The helo hit tail first, which caused the tail to separate. The Huey then bounced and struck the ground again, killing both pilots and three aircrewmen in the aft cabin.

You probably get a queasy feeling deep in your gut as soon as you read "unplanned, unbriefed and unauthorized maneuvering." Maybe you could have guessed the outcome. But this article isn't about the folly of impromptu EVM; it's about the hazard of settling with power in EVM. Settling with power can happen, whether or not you properly brief for EVM.

The UH-1N was in a situation where power required exceeded power available, and where insufficient altitude was available to recover. How can you determine the maximum rate of descent that can be arrested and the power required?

Excess-power charts have been popular and available for fixed-wing fighters for quite some time. They are now being developed for helicopters. A good introduction is "Energy Maneuverability For the Helicopter Pilot" by Capt. J. Thomas, USMC, in the September 1986 MAWTS-1 Newsletter. Excess-power charts graphically depict what you can and can not do in terms of rates of climb and descent, angles of bank, and turn radii, depending on your gross weight and configuration, and operating altitude.

The idea is to superimpose your chart over your potential adversaries and compare relative performance advantages. This comparison can yield important clues as to where to fight your helicopter — and where not to fight.

Even without these charts, we can perform a simple analysis of the power required to halt a rate of descent for a given scenario. Let's take a look at what happened to the SAR UH-1N.

After the downwind turn, just prior to the mishap, the aircraft had 35-45 knots groundspeed, which translates into a TAS of 0-15 knots based on a 35-knot tailwind component. The HAC pulled 100 percent torque at 50 feet in an unsuccessful attempt to arrest the rate of descent. If we assume a groundspeed of 35 knots, with a 35-knot tailwind, the Huey was essentially in an out-of-ground effect-hover. According to the NATOPS chart, the torque required to hover is approximately 83 percent at 50 feet AGL, which is where the HAC pulled 100 percent torque.

There was an additional power requirement to overcome the rate of descent. This requirement can be modeled as the rate of change in potential energy, which is the aircraft gross weight multiplied by the vertical velocity (and some unit conversions). A 9,500-pound Huey descending at 8.33-13.33 fps (500-800 fpm) requires an immediate application of an additional 143-240 shaft horsepower or 12-20 percent additional torque to halt the rate of descent. This results in total torque required of 93-103 percent at 100 percent Nr. It wasn't available. Any droop in Nr would reduce the power applied for the same torque setting because power equals torque times rpm. (This calculation assumes nonaccelerated flight, constant Nr, and neglects vertical parasitic drag of the fuselage in order to streamline our analysis.)

Any time an aircraft operates close to the ground, which is where most helicopter EVM occurs, the hazard of settling with power is always present.

Lt. Anthony is the aviation safety officer for HSL-46.

Embellished Target

By Capt. Keith Esplen, CAF

DURING the spring of 1983, my squadron was engaged in a heavy program of night flying. I was one of those who needed to get night time in the CF-104, so I was on the schedule. At the time, we were flying from CFB Baden Soelingen, West Germany. I planned a routine hop using TACAN Training Route 2A, which would take me essentially northeast, east and return. After filing my IFR flight plan, I took off.

Once airborne, I called Rhein Radar and told them I would be an "embellished target." In other words, I was telling the air defense system that I didn't mind if their air defense assets were vectored onto me for proficiency training. It's a good system for the European air defense squadrons and the controllers, and it takes very little effort to set up. Rhein told me to squawk the embellished target IFF code on Mode 3A.

I soon had an F-15 driver call to say he was going to do some intercepts on me. Sure enough, 30 seconds later, I got the distinctive F-15 radar strobe on my RWAR gear — front quarter, about my 1 o'clock position. The strobe intensified, indicating I was locked up. I scanned the blackness to see if I could pick him up running on me.

The next thing I saw was a mass of lights really close, passing slightly from right to left, directly over me. I estimated that the lights missed me by 100 feet or less. That got my heart pumping. It happened so fast, I didn't have time to react. I wondered if the F-15 driver had realized how close we had come.

The F-104 is a poorly illuminated aircraft at night. This F-15 pilot may have been having trouble with either his radar or firing solution, though I don't know for sure. He definitely violated the ROE for a front quarter shot. Maybe he saw me at the last second.

Sitting fat, dumb and happy as an embellished target, droning along for nighttime, could be hazardous to your health. ◄

Capt. Esplen has flown the CF-104, CF-5 and CF-18 with the Canadian Air Force. He is currently the F/A-18 and F-5 analyst for the Naval Safety Center.

Flat Spin in a Tomcat

By LCdr. Kurt Daill

"SUCCESSFUL F-14 flat spin recovery procedures have not been demonstrated; therefore, once the aircraft is confirmed to be in a flat spin, the aircrew should jettison the canopy and eject." — F-14A NATOPS Flight Manual (NAVAIR 01-F14AAA-1).

The flat spin is the dreaded black hole of F-14 aircrews. But F-14s don't immediately go into flat spins.

As an F-14 pilot familiar with flat spins, I can assure you that our bold-face procedures for spin recovery are viable. The decision to eject, once in a confirmed flat spin, should be based on the pilot's ability to hold spin-recovery controls and aircraft attitude. Proper use of the aircraft restraint system along with accurate analysis of the extent of departure from controlled flight will be critical to a timely recovery.

Radical departures can be prolonged and spins induced by applying spin-recovery procedures prematurely. I feel it is time to share my experience in Approach after reviewing F-14 departure/spin-related mishaps that have recurred over the past three years. (My experience was initially reported in FITRON ELEVEN MSG DTG 292100Z, Aug 85.)

My RIO, Lt. Don Gaddis, and I manned our Tomcat as Dash 2 of an Orange air flight with the mission to simulate air-to-surface missiles for USS *Coral Sea* (CV-43). Our jet was configured with LAU-93 rails on stations 3 and 6, LAU-92 rails on stations 1 and 8 along with Sidewinder adapters and LAU-7/A launchers, and external fuel tanks on stations 2 and 7. Takeoff, rendezvous and climb to FL300 were

uneventful. Due to encounters with F/A-18 Hornets defending CV-43 on preceding days, we fully expected them to intercept us during our transit to station, and this day was no exception.

Our first clue to their presence was a radar phase hit off the left side followed by a tally by both aircrew on an F/A-18 at 9 o'clock. Alerting our wingman, we began a hard left-hand, nose-low turn. We didn't realize that we were in the heart of the lateral-control, rudder and cross-control induced departure areas.

At only 275 KIAS (.73 IMN), I engaged afterburner. Anyone experienced with the Pratt and Whitney TF-30-P-414/414A engines knows what bold-face procedure I was then faced with. Instead of orange glows in my afterburner section, I saw bright orange glows of the engine stall lights.

Unloading the aircraft and selecting both throttles to idle, I tried to clear the engine stall(s). The Tomcat began an uncommanded roll/yaw to the left and pitched about 60 degrees nose low. This departure was very unusual since it did not have any adverse yaw. Because of the dynamics of the maneuver, I could not determine which engine had stalled. The aural warning tone stopped after about three seconds. All my attention was preoccupied with the out-of-control recovery.

I had my mask on and was able to select hot mic to tell my RIO that I was trying to keep the nose off the horizon. As a rule, I always fly with my lap straps very tight to prevent injuring my spine or legs in the event of an ejection. (I didn't think to lock my harness since I was able to effect full control authority and remain erect in my seat.) *Without this cockpit discipline, I am convinced that I would have been pinned against the ACM panel and forced to eject.*

I was now holding the stick full forward and gradually applied right rudder to full deflection to bring the aircraft under control. The jet was oscillating from a 60-degree nose-low pitch attitude to the horizon as it continued a noticeable yaw to the left. After

. . . After what we estimated as six complete 360-degree flat turns in yaw, the airspeed built rapidly from 0 to 140 to 360 KIAS in two to three seconds . . .

turning through 720 degrees in yaw and four complete pitch oscillations, the nose stabilized at 10 to 15 degrees below the horizon with no pitch or roll rate and a very rapid left yaw rate. A spin!

Convinced that we couldn't be spinning, I checked the airspeed indicator, and much to my surprise, it indicated zero. So we were in a spin. Neither of us could believe it. I woundered briefly what I had done to deserve this fate. The next thought I had was that I had induced this spin with incorrect departure recovery control (i.e., using right rudder when left was appropriate). So I neutralized the controls and confirmed that I had 30 units angle-of-attack and that the turn needle was, in fact, pegged to the left. I then positioned the stick with both hands full left and forward, and reapplied full right rudder.

From my past experience as a spin instructor in Training Command, I was convinced that an increase in airspeed was the key indicator of recovery. I concentrated on the airspeed indicator while maintaining spin recovery controls. After what we later estimated as six full 360-degree flat turns in yaw, our airspeed increased rapidly from 0 to 140 to 320 KIAS in two to three seconds. I neutralized the controls at approximately 16,000 feet, and the Tomcat bottomed out at 14,000 feet. The yaw rate stopped instantly as the aircraft recovered in a 20- to 30-degree nose-down attitude with both engines running normally. Postflight inspection showed no discrepancies.

Initially when my wingman saw us depart, he called "watch it" and then tried to follow us down. Despite his valiant attempt to beat us to 10K, their best rate of descent was no match for our departed aircraft. Separation between the two jets built rapidly. We were out of the departure-spin before they estimated our altitude at 10,000 feet, so a call to eject was never given.

During our post-mission brief several points were made. At subsonic speeds, F-14 departure characteristics are affected by Mach number, angle-of-attack (AOA), maneuvering flaps-slats, roll SAS

and external stores. In our incident every one of these factors worked against us.

Our Mach number was relatively high for a low indicated airspeed. High AOA was easily induced with minimum back stick pressure. I had roll SAS on from the start of departure through recovery since ACM-type maneuvers weren't really planned, and I had just disengaged the autopilot. Likewise, the alpha computer circuit breaker was out since we were not configured for maneuvering flight.

I am convinced roll SAS contributed to the departure/spin entry. NATOPS states, "Rudder inputs with roll SAS on can cause very violent departures because roll SAS commands differential tail opposite the rudder input even if the stick is centered."

Several things contributed to our recovery, not the least of which was luck. Both engines kept running normally, giving us full hydraulic and electrical power. We had full flight-control without a multiple emergency to contend with. We also had ample altitude.

The engines remained intact because the aural stall-warning tone worked as advertised, and we reacted promptly to this first emergency. Without the stall-warning system, we may never have known that this malfunction existed. Roll SAS, which probably hurt us during the departure phase, certainly contributed to our recovery by permitting us additional differential tail deflection. Proper use of our restraint harnesses cannot be over emphasized, and we would have been in deep trouble without tight lap straps, and F-14 buno 161869 would be at the bottom of the sea.

A fully developed flat spin is recoverable with our current bold-face procedures. I question the alternate recovery technique which calls for as much aft stick as possible, full lateral stick into and roll SAS on. Although I understand the logic for this procedure and agree with the selection of roll SAS on for spin recovery, using aft stick opens the door for another "Catch 22" if the departure is not analyzed correctly. Aft stick utilization must be strictly contingent upon indicated yaw rate presented to the aircrew on TID or HSD in the front cockpit.

. . . There is a very delicate balance between jumping out of a jet that is recoverable and staying with an aircraft until you lose the option to eject. . .

The primary goal of any departure recovery is the reduction of AOA, and the stick will stay forward in my cockpit without a confirmed yaw rate in excess of 110 degrees. Roll SAS is a great feature for takeoff, landing and when the autopilot is desired. Unfortunately, it does a few undesirable things in a maneuvering environment. I consider it prudent to select the roll SAS off unless a checklist or flight control mode specifically requires it. Maneuvering devices reduce departure susceptibility, so fly with the alpha computer circuit breaker in whenever your SOP allows. It becomes very difficult to spin an F-14 with roll SAS off and maneuvering flaps/slats in auto because exposure to all Region 1 and 2 departure areas is virtually eliminated. Get into Chapter 11 of NATOPS and know it cold. Forward quarter tactics might drive us into a high altitude war. We can ill afford not to understand the weaknesses of our platform in this environment.

In our incident, having roll SAS on was instrumental to our recovery. I urge the next F-14A NATOPS conference to consider modifying step 3 of the upright departure/flat spin bold-face procedure to include "Roll SAS — On" following "Stick — Into Turn Needle." The boldface procedure should address use of aft stick as a function of indicated yaw rate. Although this is spelled out in the NFM, it should also be clear in the boldface.

As indicated in my opening quote from the NATOPS manual, the aircrew has little leeway to make the decisions that they're paid to make when faced with such an emergency. There is a very delicate balance between jumping out of a jet that is recoverable and staying with an aircraft until you lose the option to eject. I firmly believe that this decision should be made in the cockpit.

An Orange Air Battle Group Support Mission was the least likely place that we expected to be faced with an out-of-control flight situation. ◄

Lt. Daill, an F-14 pilot, is assistant maintenance officer with VF-84 at NAS Oceana, Va. His first assignment was with VF-11 followed by a tour as an instructor at Top Gun.

Training Rules and Their Effect on Actuarial Tables

Cobra by Peter Marshall Lane

Helicopter ACM

By Capt. Mark Bamburger, USMC

TRAINING Rules (TR) are one of the most important elements of air combat training. Only effective and applied Training Rules will allow aircrew members to fully develop their air combat maneuvering (ACM) skills.

The training rules are designed to support the ACM training syllabi of all Marine Corps helicopter communities. Any disparities between these rules and MCO P3500.14 (Training and Readiness Manual, Vol I) or MCO P3500.14 (Training and Readiness Manual, Vol III) shall be resolved in favor of the most restrictive order. For those who are unfamiliar with helicopter versus helicopter ACM, I'll discuss Training Rules and provide ampliflying information.

Helicopter-Versus-Helicopter ACM Training

(1) ACM training shall be conducted only during the day. Training area weather must afford a ceiling of at least 1,000 feet AGL, and not less than three miles visibility.

— It's a straight-forward rule, but ACM flight leaders must take into consideration prominent terrain, shadows and haze. They must conduct the flight to avoid areas of marginal visibility. Don't turn "can do" into doo-doo.

(2) ACM training shall never be conducted with an aircraft carrying nonessential crew members or passengers.

— All crew members on board an aircraft involved in ACM are an integral part of the crew and are included in the aircrew brief.

(3) ACM shall never be conducted through overcast or undercast cloud layers.

— When you're working with low ceilings, the rules of common sense apply. There's always another day to get the "X."

(4) Helicopters conducting ACM training must be equipped with operable UHF or VHF radios. Each crew member shall use a common ICS system.

— Helicopter aircrewmen are an invaluable asset and a key element in transport lookout doctrine. Visibility in helicopters is not geared toward air-to-air manuevering. Well-trained, quick-reacting aircrewmen are critical to proper tactical formation maneuvering and to effective lookout. On the tactical side, have you ever tried to maneuver to a blind 6-o'clock position on an aircraft equipped with four sets of eyeballs?

(5) All participating aircrews must monitor a common UHF or VHF frequency unless operating on a TACTS or similarly equipped ACM range where ground controllers are responsible for aircraft separation. Appropriate guard frequencies shall also be monitored.

— Currently only AH-1 Cobras have been equipped with TACTS pods and have routinely operated on

Cubic Corp.

Cubic Corp.

A Marine Corps ground crew loads a TACTS AIS pod on an AH-1 Cobra helicopter before a recent visit to the training range near Yuma, Ariz.

instrumented ranges. Instrumented or not, everyone involved needs to have the capability to terminate the engagement. The radio suite in our helicopters almost always allows for assigning a common "safety" frequency to be monitored constantly by all participants, whether it is required or not. Remember, mandated requirements are the minimum, not the optimum.

(6) Engagements will begin only after an initial "fight's on" radio transmission has been identically acknowledged by each participating crew.

— Even though helos don't approach the sound barrier, the close proximity and relative closure rates associated with helicopter ACM causes situations to develop rapidly. All players need to be on the same sheet of music.

(7) Once the "fight's on" broadcast has been acknowledged by all ACM participants, helicopters will be flown no lower than 100 feet AGL.

— One hundred feet is the limit. It gives a good balance of a realistic flight profile and terrain avoidance. Don't forget to brief natural hazards (trees, cactus, etc.). If terrain or obstacles dictate, 200 feet or 300 feet AGL as a limit for particular flight does not degrade training: It can do much toward making all players feel a lot more comfortable.

(8) Separation between any two helicopters shall not be less than 500 feet except during tail chase maneuvers briefed to allow minimum aircraft separations of 200 feet.

— If you get within 500 feet during an engagement, you've probably already been shot four or five times by some type of on-board weapon. Also, no real learning is accomplished once the helicopters are in the "furball" without any chance of disengagement. Also, remember that the 200-foot tail chase minimum applies only to "canned" specific maneuvering, not to free-play scenarios.

(9) Crews shall perform only the air combat maneuvers briefed prior to the flight.

— Never let the enthusiasm of a sortie that's going well tempt you into carrying it one iota beyond what was covered in the brief.

(10) Standard, left-to-left passes will be attempted for all opposing maneuvers, though no excessive or erratic maneuvering should be employed to effect a left-to-left pass. Perceived needs for right-to-right passes shall be communicated by "right-to-right" radio transmissions and will be identically acknowledged. (This Training Rule differs from fixed-wing intercept terminology because of basic helicopter performance.)

— Don't allow a hazardous situation to develop. If there's any doubt about the bandit's intentions, call it!

(11) No close-range helicopter engagement will involve more than two 360-degree turns.

— After two turns, you will have met your learning objectives. No one learns anything staring through each other's rotor system.

(12) Pilots should not attempt to counter an adversary's altitude advantage with erratic or excessive climbing maneuvers.

— *Never* exceed the NATOPS limits of the aircraft.

(13) Helicopter crews will signal lost communications with a series of pronounced roll reversals.

— Contrary to popular belief, helicopters can rock their (rotary) wings.

(14) Aircrews shall immediately broadcast losing sight of any participating aircraft, and will immediately acknowledge such a broadcast.

— If you lose sight, terminate immediately. The lack of disengagement capability and 360-degrees lookout doctrine for transport helicopters usually means one of two things: You are directly over the bandit, or he is directly over you. Even a short delay in acknowledging lost sight can turn into a disaster.

(15) An engagement shall be terminated if all aircrews unintentionally lose sight of each other. The engagement will not be resumed until all participants have reacquired each other.

— *Immediately* terminate the engagement, same as number 14.

(16) An aircrew placing itself between the sun and an opponent shall be responsible for helicopter separation. This up-sun adversary shall also remain predictable.

— Generally, helicopters do not use the vertical plane and sun to the same extent as fixed-wing aircraft. Keep in mind low sun angles and the effects of terrain shadowing.

(17) Aircrews positioned in tail chase behind a diving adversary shall monitor the altitudes of both aircraft.

— At 100 feet, *any* aircrew can make an altitude call. If it looks too low, or a *trend is developing,* call a terminate and start again.

(18) With an offensive aircraft approaching gun parameters, defensive aircraft shall not dispense flares as part of a gun defense or as a distraction.

— That MK-46 decoy flare may not seem to travel far, but it'll make a mess if it's sucked down your wingman's intake. Thoroughly brief the use of all expendables. expendables.

(19) A radio transmission of "knock it off" will be used to stop an entire ACM training evolution, and it will be immediately acknowledged by all participating aircrew.

— Self explanatory. It is unquestionably better to "knock it off" and start again than to "knock it off" to start the SAR effort.

USMC

(20) A radio transmission of "terminate" will be used to stop a single local engagement, and it will be immediately acknowledged with identical terminate transmissions from all participants.

— When "terminate" is called, the engagement is over. Nothing is worse than getting gunned from a dead 6 o'clock while you're heading outbound for the next setup.

(21) An engagement will be stopped under any of the following circumstances:

(a) Any training rule is broken. Don't be shy. Anyone can stop an engagement.

(b) An unsafe situation is perceived by any member of any crew.

— Keep in mind the experience level, currency, situational awareness and comfort level of the crews. If something doesn't feel right to you, you're probably not the Lone Ranger.

(c) "Terminate" or "Knock it off" is broadcast.

— See (21)(a).

(d) Any participant experiences a radio failure.

— Self-explanatory.

(e) Planned learning objectives have been met.

— The purpose of each line number is to meet the prebriefed learning objective. Once the desired sight picture, weapons parameter or evasive manuever is accomplished, move on to the next line number.

(f) An interloper enters the training area.

— No, it's not an endangered species with sawlike horns.

— However, a Cessna 150 can have the same terminal effect as a flight of four B-52s. Never *assume* all members of the flight see an aircraft that may be a potential hazard.

The Training Rules are only part of a detailed brief covering aircraft handling, weapons effectiveness, individual and crew responsibilities, and scripted learning objectives. Only when tactical proficiency is combined with realistic training can the helicopter crew (and the Marines on board) be afforded the best chances of success in an actual conflict.

Helicopter-versus-helicopter ACM has its own peculiar hazards, some of which aren't applicable to fixed-winged-versus-fixed-winged ACM (e.g., 100 feet AGL, relatively tight engagements, limited vertical maneuvering, relatively restrictive aircraft authorized flight parameters). Nonetheless, the helo bubbas have an enviable safety record as it applies to EVM and ACM. We've done a great job in learning from past experience on the fixed-wing side, and it is up to all of us to continue to capitalize on these strides. Safely progressing toward increased combat readiness is the goal. Sound, time-tested Training Rules administered by mature flight leaders with experience and common sense will keep us on track.

Training Rules are the best flight insurance you can have. Let the dividends pay the premiums! ◄

Capt. Bamburger, an AH-1 Cobra pilot, is the AH-1 weapons and tactics instructor with the Aviation Development, Tactics and Evaluation Branch at the Marine Aviation Weapons and Tactics Squadron 1, MCAS Yuma, Ariz.

Training Rules

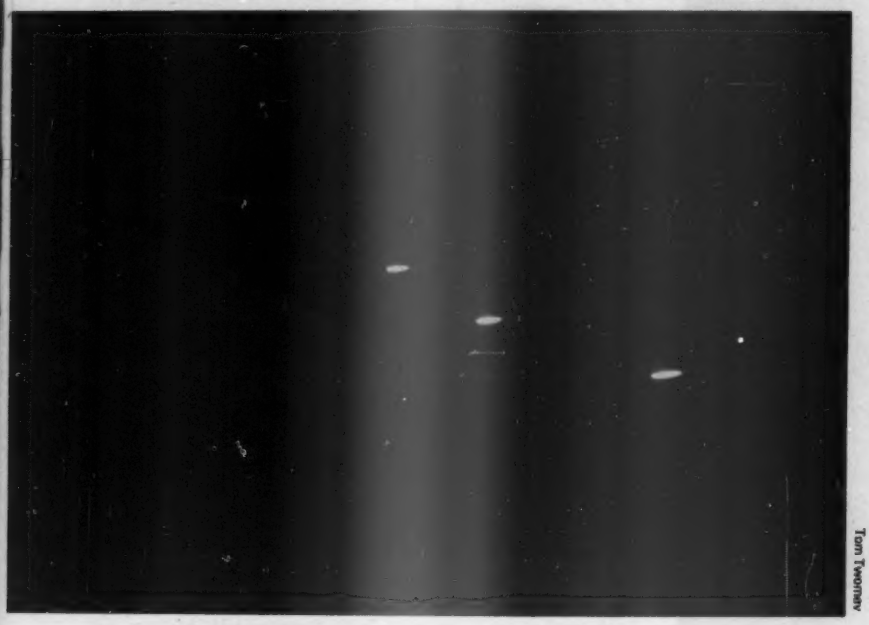
By LCdr. Bob Knutsen

EVERY ACM brief includes a review of the Training Rules (TR). Why? Like NATOPS, many of these rules are designed to produce reactions that will keep us alive. When two aircraft are pointed at each other with more than 800 knots of closure, it's nice to know that both will instinctively clear to the right without crossing flight paths. To someone who's been briefing and flying ACM for years, TRs are second nature and self-explanatory. To others who may be fairly new to the arena, some of the rules are worth a closer look, and a few extra minutes in the brief.

Soft deck vs. hard deck. OPNAV says "high angle of attack (AOA)/slow speed maneuvering shall be terminated passing through 10,000 feet AGL...guns defense shall not be executed below the soft deck." Is this reasonable? Well, what can happen at high AOA or slow speed? Departures and spins. My airplane takes between 8,000 to 10,000 feet to recover from a fully developed spin once recovery controls are applied. How about yours?

OPNAV also says "below the hard deck (5,000 feet AGL adjusted for cloud ceiling or terrain)...no sustained maneuvering shall occur." Usually this means terminate; however, it can mean up to 180 degrees of turn as indicated by the low altitude TR, if qualified and briefed.

What about the area between the hard deck and the soft deck? It's good for low altitude run-ins, for extensions, and for "the bug." While there are good tactical reasons for hugging the deck, 5,000 feet is a nice cushion for error in a training environment. Recovery from a high-speed, nose-low attitude can use up every bit of 5,000 feet real fast.



Tom Twomey

Midairs. Several items in the TR are designed to keep airplanes from trading paint: no blind lead turns, no head-on guns, and 9,000-foot min-range for

Baranek

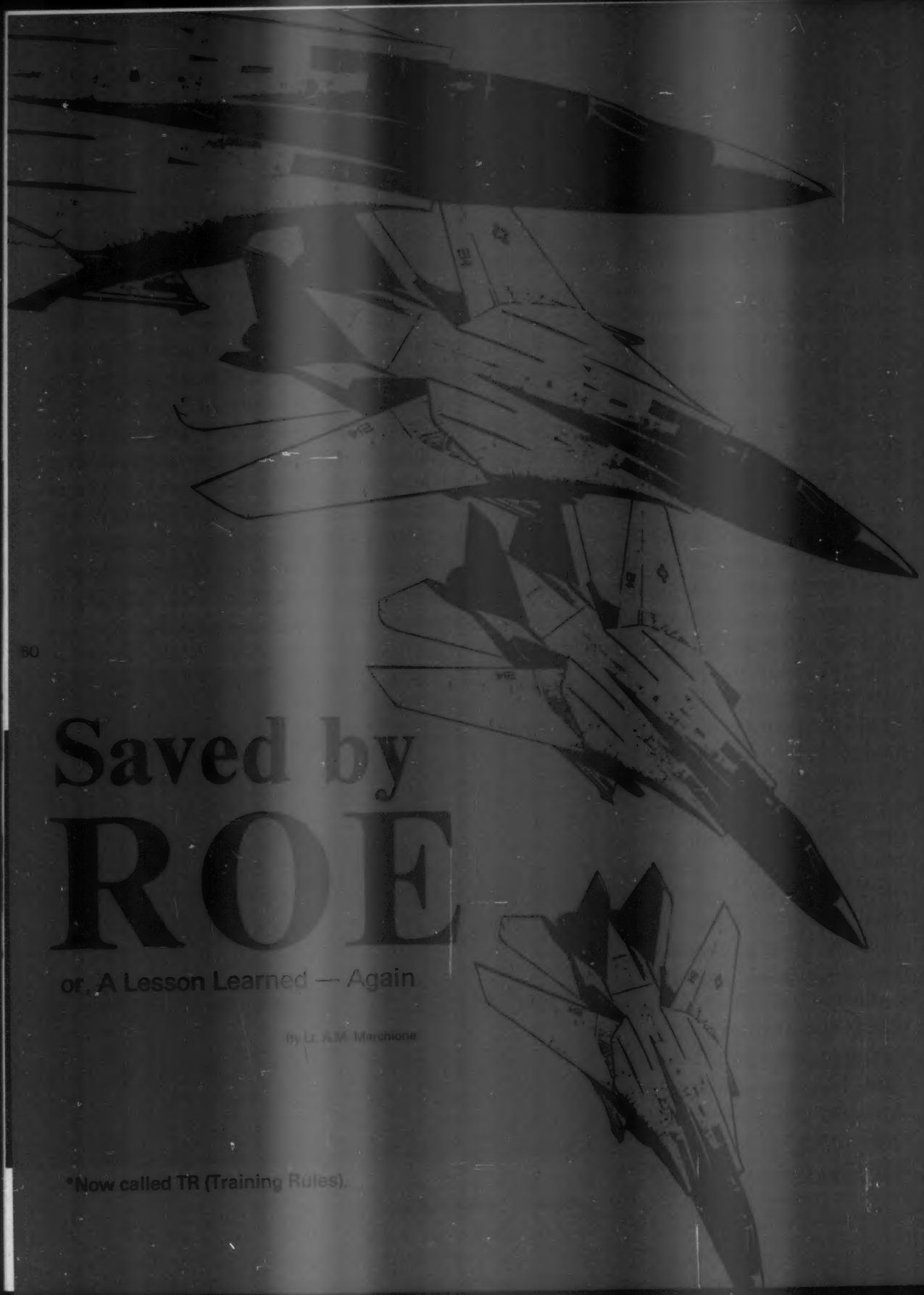
head-on missiles. Two jets, each doing 400 knots, will cover 9,000 feet in 6.7 seconds. Combine this rate of closure with the distractions of switches, symbols, and searching for tones on wily bogeys, and these rules are quite reasonable. The "nose high goes high" rule and 500-foot bubble, along with a good awareness of energy states are good rules to live by in the slow-speed regime, such as in a horizontal scissors with limited nose authority and converging tracks.

Speaking of the 500-foot bubble, when your opponent does a vertical extension, and you start the uphill chase, do you allow yourself enough knots to get out of the way when he calls "ballistic" 2,000 feet above you, or when he swaps ends and you're looking at intakes getting real big, real fast?

Out-of-control flight. Every brief ends with a discussion of out-of-control flight procedures, usually a contest to see who can recite the entire litany in 10 seconds or less. From August 1978 to August 1988, 54 Navy and Marines Class A mishaps occurred during ACM sorties, 31 of these resulting from out-of-control flight. When you brief your spin procedures, do you really think through what you'll see and do when you find yourself hanging in the straps with your head beating off the plexiglas?

We would probably dispense with some training rules in combat. For example, if you were below 5,000 feet AGL and found a for-real bad guy slipping into a guns position, a good move would be to pop flares in his face while doing your best guns-defense turn into a big puffy cloud. Other rules, like briefing out-of-control flight, bingo, NORDO, and having a built-in game plan for avoiding midairs are always good. In general, TRs yield a margin of safety in a peacetime training environment. Sure, you should fight like you train and train like you fight — just make sure you live through training. ◄

LCdr. Knutsen is the ASO for VFC-12, a reserve adversary squadron at NAS Oceana. He was an instructor with VT-86.



Saved by ROE

or, A Lesson Learned — Again

By Lt. A.M. Marchione

*Now called TR (Training Rules).

OUR flight of two Tomcats climbed through the clouds on the way to the East Coast TACTS Range for a 1 v 1 similar ACM mission. We broke through the tops at 10,000 feet with the deck stretching as far as the eye could see.

Both the applicable TR and squadron SOP require a hard deck of 10,000 feet 1 v 1 similar ACM as well as 5,000 feet above the lowest cloud deck for all ACM flights. With the tops at 10,000, we were, therefore, required to use a hard deck of 15,000. At 10,000 feet, the F-14 doesn't have as much thrust as at sea level, and having to raise the hard deck another 5,000 feet reduced our thrust and turning ability even more. In short, our ACM flight would not be as much fun.

We would have preferred some good, hard turning close to sea level. However, I would not regret the decision to use a 15,000-foot hard deck.

The most exciting part of the first engagement was trying to visually acquire my wingman since we didn't have a radar and had briefed a 35 nm setup for the first fight. I started to get a little concerned as we closed, but at last I saw him.

As our GCI controller counted down the miles, I spotted my wingman slicing down on me from the left giving him an offensive advantage. No problem. I initiated a hard turn into him and began a contest to see who could manage the best turn rate as we spiralled from 28,000 feet to the artificial hard deck at 15,000. In a short time, the flight degenerated into a standoff, so we called knock-it-off. I couldn't help but think that if only that cloud deck hadn't been there, the outcome might have been a little different.

The next engagement was a visual setup, and it promised to be a little more exciting. This fight soon provided a lot more thrills than I anticipated and would want to see again.

The setup progressed in a downhill spiral; however, this time it appeared that we would both fly through the hard deck at 15,000 feet. A kill being a kill, I leveled my wings at 17,000 feet, and tried to level off before breaking the hard deck. I was hoping my wingman would not notice our rapidly decreasing altitude, bust the hard deck, and would splatter on the artificial rocks below, giving me the win. I was at 250 knots, pulling the stick back hard to level off. I was promptly rewarded with a violent departure in which the Tomcat snapped inverted, then rolled into a nose-down spiral to the right. I could clearly see we were spiralling right by looking outside. I called knock-it-off since I had departed. I ended up being the one splattered on the rocks, but that wasn't a worry now.

I was surprised and angry that I had departed, but I felt the departure was no big deal. I had departed the Tomcat before, although never this violently, and I had always easily recovered with minimal altitude loss. I also knew I had plenty of altitude in which to recover.

My first reaction was to follow boldface procedures: stick forward, neutral-lateral, harness locked. The next step was to put the rudder opposite the roll or yaw. I glanced at my airspeed and saw 210 knots. I knew I was not spinning; at that airspeed, I thought I could recover without any rudder input. I slowly pulled back on the stick, and the nose raised a little. Then, the airplane departed again, and the airspeed dropped to 160 knots.

We were still spiralling right and downhill rapidly. I hadn't looked at any other gauges, but now I looked at my AOA, and it was bouncing between 23 to 26 units. I applied boldface procedures again, but again, I did not apply any rudder.

The cloud deck at 10,000 feet was now looming in front of my windscreen and threatening to engulf us. At 210 knots and 17 units, I tried to recover but got precisely the same results. The aircraft departed once more, and the airspeed dropped to 160 knots. We punched through into the clouds as my RIO shouted, "Do you have it?"

I said, "I've got it," but I knew full well that things were now looking grim. The thought of ejection entered my mind. I quickly decided that I'd try one more recovery and if for any reason we went below 5,000 feet, I'd yell for ejection and pull the lower handle.

I didn't know that at this time my RIO already had his hands on the handle and was preparing to eject. However, my response made him wait for a few more critical seconds. If he had ejected us at that point, I wouldn't have been surprised. Approximately 10 seconds had elapsed, and I could not understand why the airplane would not recover.

Now, I went full forward stick

. . . I quickly decided that I'd try one more recovery and if for any reason we went below 5,000 feet, I'd yell for ejection and pull the lower handle. . .

and double-checked neutral lateral stick and rudders. We were 60 degrees nose down but were still slowly spiralling to the right. This time, I would wait until our airspeed climbed to 230 knots before attempting a recovery.

We broke through the overcast. I could see numerous white caps on the water through a hole in a broken cloud cover below us. I wondered briefly what the mishap investigation report would say. I later found out that at the same moment, my RIO was thinking how cold the water was going to be.

I glanced at the tumbling VDI artificial horizon and thought, "That's exactly what it looks like in the simulator when you're recovering from a departure." The first time I'd seen it in the RAG high-angle-of-attack simulator, I had crashed.

The range training officer (RTO) now yelled, "Watch your altitude!" This was quickly followed by the other RTO yelling, "Altitude! Altitude!" I replied matter-of-factly, "I'm trying."

Passing 7,500 feet and 230 knots, I went to idle and gently programmed the stick back to 17 units AOA. The altimeter slowly stopped its counterclockwise rotation as we leveled off at 5,200 feet, once again in the clouds.

I felt elated but also surprised. I had expected to depart a third and final time. Finally realizing that we were, in fact, OK, I let my airspeed increase before starting to climb back up to altitude. I told the RTOs and my RIO that everything was OK as I let my airspeed drop to 190 knots in my haste to climb to blue sky again. I was actually a little shaken and disoriented.

After we reached sunlight, it took us two minutes to join with our wingman, due mainly to our disorientation from the departure. I thought briefly about returning to base, but we still had a lot of gas. I also firmly believed at the time that it was better to stay in an airplane after a close call than to land early and lose self-confidence.

With those thoughts in mind, we shook it off and fought another 1 v 1 ACM engagement. After we returned home, we were told that the RTOs briefly thought we had ejected until they saw the airplane level off and heard us say we were OK. It had been that close.

TR saved us by giving us an additional 5,000 feet to play with. TR is specific for a reason. There is very little interpretation required. If I had used a 10,000-foot hard deck and tried to level off just above that, then departed, I would not have stayed with the jet, period.

During the debrief at the TACTS Range, I saw that we had, in fact, been in a spiral to the *left*, not the right as I was so sure I had been. Even my RIO was sure it had been to the right, but then, he didn't have a turn needle. In spite of all my training, I was still so confident I knew what my turn direction was that I never looked at my turn needle. My airspeed was high enough that I knew I was not in a spin. I had, however, been in the incipient stage of a spin when I first departed with my AOA on the TACTS Range reading +56. I had stopped that by applying forward stick. If my

USAF via Lon Nordeen McAir

airspeed had not been as high as it was, I might have erroneously applied rudder into the spiral rather than opposite to it. The lesson learned — or rather, re-learned — was to look inside at your instruments during a departure or spin; never look outside. The disorientation during a severe departure is much more than most people realize, regardless of experience.

Initially, nothing was found wrong with the aircraft that would cause it to depart more easily or prevent it from recovering normally. There were no warning caution, or advisory lights, spoiler malfunction, or any other obvious indications that anything was wrong with the plane.

However, on the aircraft's next flight, its wingmen noticed the wings swept at 45 degrees when the F-14 was at 0.4 mach. Normally, they would be at 20 degrees. Investigation revealed a loose or broken wire leading to the Central Air Data Computer that was causing the wings to be erroneously programmed aft at intermittent times.

Years ago, I read an *Approach* article about an A-4M pilot who continued his ACM hop despite several departures. He did not recover from his last departure. The mishap investigation determined that the jet had a slat problem that caused the control problems.

While our maintenance problem was difficult to pinpoint, it should be stressed that after a severe departure, the aircrew should stop the ACM and go home. It's best to examine what happened on deck, before charging into another engagement. A serious aircrew debrief is in order as well as a detailed examination of the jet by the maintenance shop.

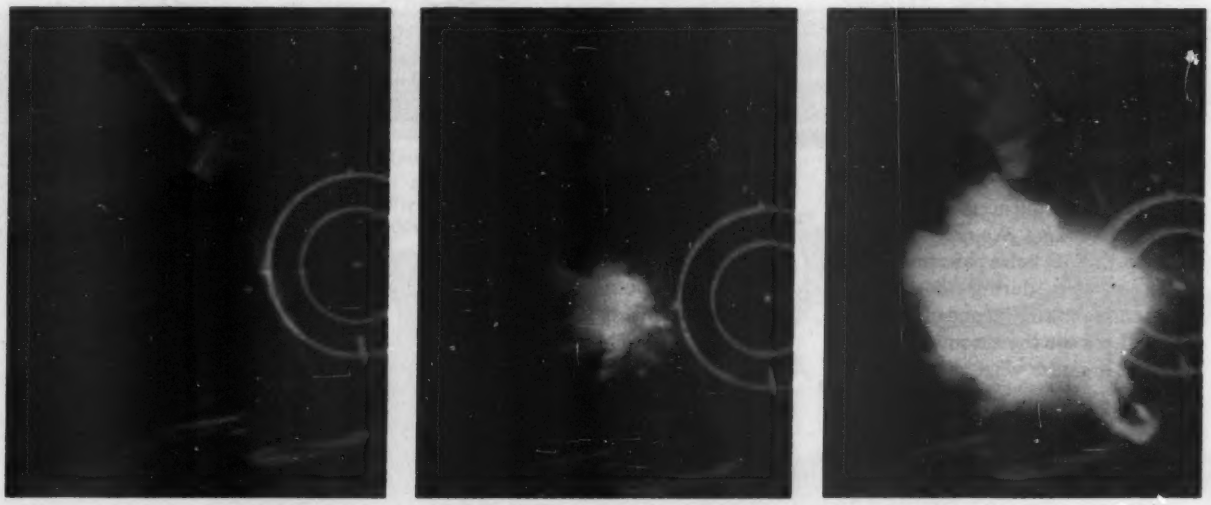
I was luckier on this day than that A-4M pilot, but only by a narrow margin. I was lucky not to have departed a second time. This flight could have had an entirely different ending. It was a "cheap" lesson this time. Next time you may not be as lucky.

Lt. Marchione is an F-14 pilot with VF-14. He is the squadron pilot training officer and a graduate of Top Gun.

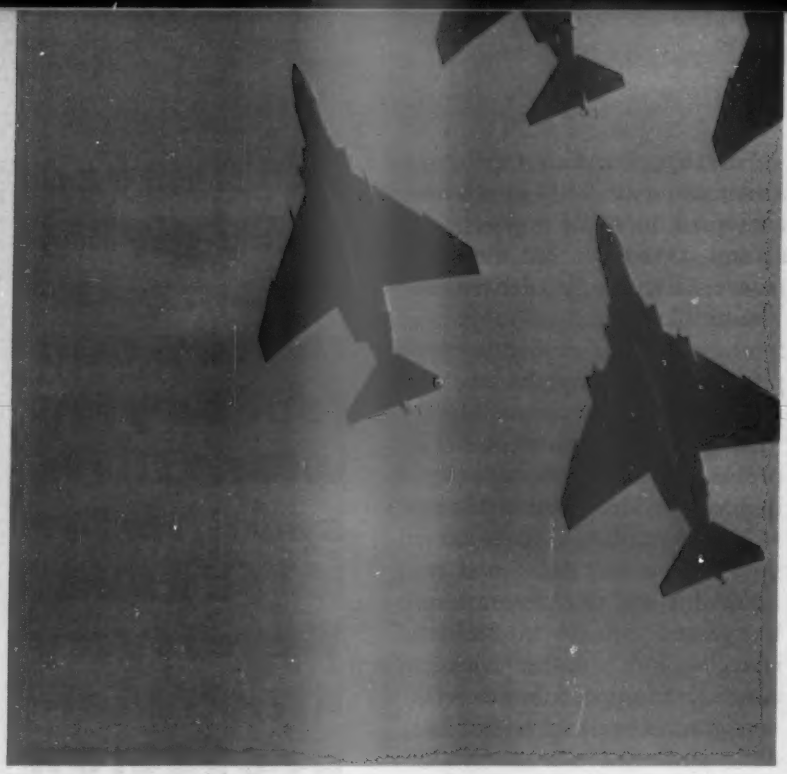
...TR saved us by giving us an additional 5,000 feet to play with. TR is specific for a reason. There is very little interpretation required...

To be sure, you've got to MAKE sure!
Cdr. Joe Satrapa (Hoser) 1988

USAF via Lon Nordeen McAir



Maj. Ralph Kuster flying a USAF F-105 makes *sure* with his 20mm cannon, May 1967



DE-GAP
After the Knock-It-Off

By Maj. Curt Seebaldt, USAF

YOU'VE been in the full-grunt, funky-chicken position for what seems like an eternity. Your neck aches, your eyes are bulging, and you are just about ready to . . . "Devil 01, knock-it-off."

Quickly, you muster the strength for a cool and collected "Devil 02, knock-it-off." Sweet Buddha — finally a rest. Not Now! Now is the time to execute some critical post knock-it-off (KIO) procedures, not a time to just roll out and rest until the world is ready for your air-to-air prowess again. The fighter community has suffered recent accidents with fatal consequences due to just that mode of thinking. We need to develop some post-KIO habit patterns that will keep us alert during those critical moments following the end of an engagement. Let's use the acronym DE-GAP to help organize what should be happening after the KIO call is made.

DE: *Deconflict.* The biggie. Clear your flight path and where you are with respect to other players and area boundaries. Don't take your eyes off your playmates. If engagement geometry has left you without a visual, admit it and get it! Also, many times you find the fight has gravitated toward the deck for energy and defensive purposes. Don't bust TR decks! In peacetime, it will get you sent home. In wartime, it will get you killed.

There have been more than a few who confused peacetime training with wartime necessity and morted themselves in the process. The ground has a Pk of 1. Nobody is shooting real bullets or squeezing off missiles, so keep training in perspective. There is a fine line between "fight like you train" and taking the engagement toward TR conflicts. The bottom line is when the KIO occurs, clear your jet from others and the area's edges. If you are the flight lead, ensure this is being done and use the radios to confirm it.

G: *Gas and instruments.* Take a look at how the machine is doing. JP-5 has a funny habit of going away quickly once the fight is on. The airframe also gets a good workout during an engagement, so sneak a glance at the telelight panel, G-meter and engine instruments to confirm that the jet is 100 percent.

A: *Area. Now, lets get the flight moving toward the "fat" part of the area and back to the altitude where you want to start the next fight. Make a quick visual update of the area weather as well. As a flight lead, you direct* the flight at this point. Don't expect others to head where you want or you'll have "beamers" to contend with. Every player will surely know the best method to get the flight in position to continue. The problem is that there are as many methods as there are players. *Direct* the flight so the beam riders don't get a chance to try their plan and waste gas in the process.

The first three steps should all take place fairly quickly after the KIO. Deconflict, check gas and instruments, and move the herd toward the piece of sky you want to begin the next fight. Then it's time for the last step.

P: *Performance.* How did the flight perform with respect to the objectives outlined in the brief? Does the setup need to be repeated or can you press on? Assess each member's performance and make the decision to repeat or continue. This is where you make your money as a flight lead instructor. Good flight leads take this time to tape or write down pertinent comments about the engagement for reconstruction in the debrief. Now you have a tool with which to recreate the fight and move everyone's learning curve in the right direction.

I've probably missed an item or two, but I believe that the basics are in DE-GAP. The bottom line is that knock-it-off (KIO) does not mean relax. Have a post-KIO plan, brief it and enforce it in the air. ◄

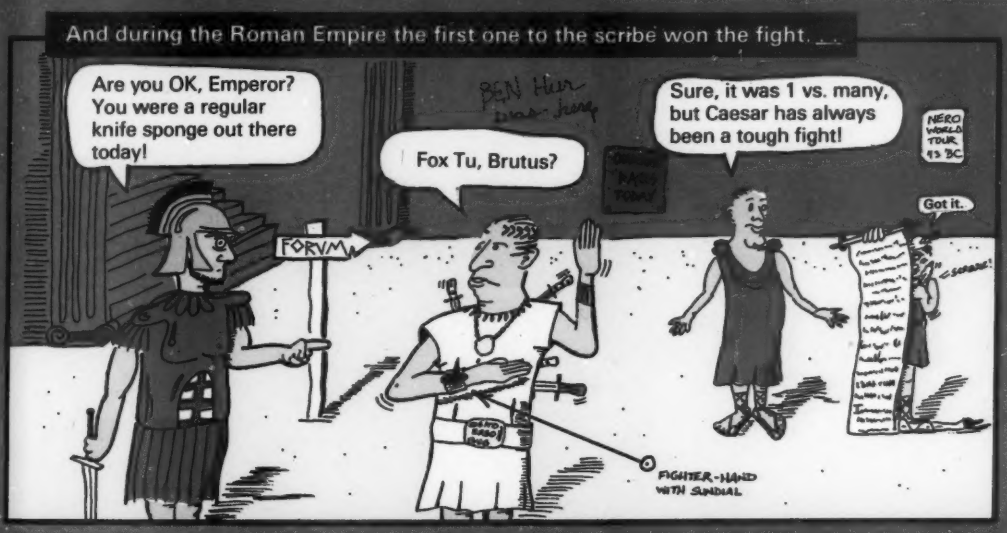
Maj. Seebaldt is an Air Force exchange RIO with VMFA-232, flying F-4s.

BROWNSHOES IN ACTION COMIX

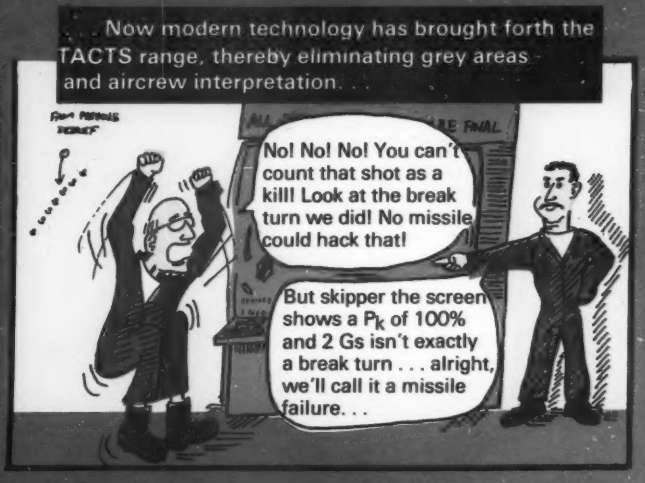
"The kind real aviators like"

Contributed by Lt. Wierd Carroll, VT-86

In prehistoric times, the first one to the cave wall won the fight. . .
. . . And then Ug stayed out of phase long enough for me to get a rock shot off. Yours hit after mine so it was slightly O.B.E.


And during the Roman Empire the first one to the scribe won the fight. . .
Are you OK, Emperor? You were a regular knife sponge out there today!
Fox Tu, Brutus?
Sure, it was 1 vs. many, but Caesar has always been a tough fight!
NERO WORLD TOUR 63 BC
Got it.
FORVM
FIGHTER-HAND WITH SUNDIAL

. . . And in Germany during WWII, the first one to the Fuhrer won the fight. . .
Ya, mein Fuhrer. The Luftwaffe has just about wrapped up the Battle of Britain. Why I myself just about shot down a Spitfire.
Why are you wet?
Well sir, I unfortunately landed a little short of the runway at Berun.
How short?
The English Channel.


. . . Now modern technology has brought forth the TACTS range, thereby eliminating grey areas and aircrew interpretation. . .
No! No! No! You can't count that shot as a kill! Look at the break turn we did! No missile could hack that!
But skipper the screen shows a P_k of 100% and 2 Gs isn't exactly a break turn . . . alright, we'll call it a missile failure. . .

Safety will logically follow from skill and situational awareness — not from artificial restrictions. . .

Capt. Clyde Phillips, 1977

Duel of Eagles by Robert Taylor

Pirate's Bounty by Mike Machat

Dogfight Over the Russels by Mike Machat

Heads Up by William S. Phillips

T.R. Swartz's MiG Kill by R.G. Smith